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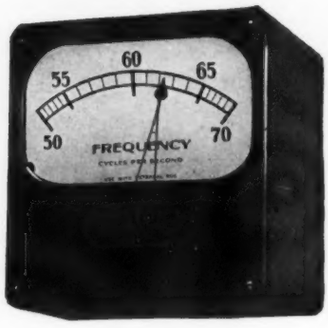
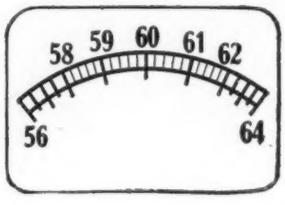
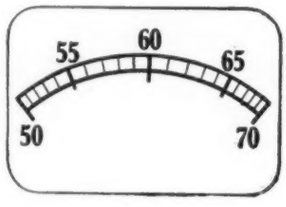
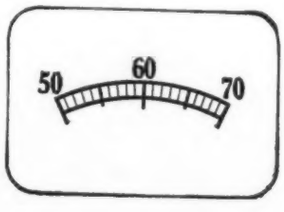




New expanded type of frequency scale.

New normal type of frequency scale.





Old type of frequency scale.

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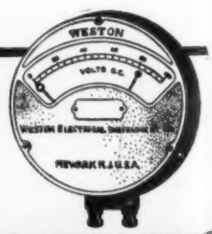

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Electrical World

Published by McGraw-Hill Publishing Company, Inc.
W. H. ONKEN, JR.
Editor

VOLUME 88 — *New York, Saturday, December 4, 1926* — NUMBER 23

Defeat of Public Ownership on the Pacific Coast—and Its Moral

WITH the count of votes cast on Nov. 2 nearly complete, it is found that the California water and power act was defeated by a ratio of about 2.63 to 1, while the somewhat similar amendment in Oregon which came up for the first time this year was lost by a vote of more than four to one. In Oregon there was a bitter fight, but in California the proponents of the measure seemingly evinced very little interest, although it may be that the advocates of the power act are keeping the issue alive and on the ballot in the hope that at some future election the political set-up will be more favorable to an aggressive campaign. Certainly little progress has been made by either side during the past four years, when the amendment has been up three times, for in 1922 it was defeated by 2.45 to 1, in 1924 by 2.35 to 1, and this year, as just stated, by approximately 2.63 to 1.

In California and Oregon—and in Washington, too, where the political pot is generally boiling—the electric light and power companies generally have accepted the election results as indications of confidence and as imposing upon the utilities greater responsibility in perfecting and rendering a widespread and efficient service at reasonable rates. To interpret the vote in any other way or to imagine that the people along the Pacific Coast are absolutely convinced of the superiority of private ownership and initiative would be suicidal. The margin may seem wide, but it is not wide enough to warrant any such conclusion and suggests more intensive work in public relations and general service.

Exchange of Energy Between Utility and Industrial Plants

SOME central-station companies operating in industrial sections where large users are generating their own power from products like blast-furnace gas are beginning to question whether it is advisable to try to sell them purchased power. The profit on any basis which is even interesting to these heavy users is generally small. Furthermore, acquisition of large blocks of power of this character is liable during periods of industrial depression to hazard return on investment more than would be the case with a number of diversified users. However, owing to the fact that some of these large industries, like steel mills, frequently have surplus power that goes to waste at times, and because they occasionally must transmit power to plants spread over considerable territory, many central-station executives are interested in negotiating agreements for interchange of power.

The situation presented is in many respects like that existing between utility companies which want to exchange power between themselves; so many of the principles that apply in such relations might apply to interconnections with large industrial plants. The exchanges of energy would have to be large enough to justify the high-voltage taps and the expensive circuit breakers and protective equipment necessary where a station is to operate in parallel with a utility system. Energy could be bought, sold or transferred to some other plant of the industrial user on much the same basis as that on which utility agreements are now worked out. If desirable, the utility company could lease the industrial generating plant and utilize its own lines for energy transfers. In return the industrial user would have the added protection of utility supply in cases of emergency and would not have to waste opportunities for producing power. Metering is said to present no difficulties.

The chief problem is to interest these large industries in which the cost of electric power may be a relatively negligible factor and to work out a mutually satisfactory agreement. There is need of a free expression of views on how this relationship can be established by steel-mill and other large industry executives, industrial consultants and utility men. Out of these expressions may come a more active interest on the part of the large industries now passive and the formulation of principles which will be mutually beneficial.

Dealer Animus—Good or Bad?

THE electrical dealer or contractor as he figures in the maintenance of good—or bad—relations between a central-station company and its customers is a factor to be taken into account. The public accepts the dealer as representing the electrical business; he is in it and of it as much as is the power company that sells the energy. There is no such sharp distinction in the popular mind between the contractor who does a wiring job and the company that puts energy on those wires as there is, for instance, between a grocer and an undertaker. The cost of the necessities and conveniences of electric service is a single item in the thoughts of the average citizen; he does not split it into two parts, the one going to the man who wired his house or sold him a flatiron and the other going to the company for kilowatt-hours. There has always been, and there probably always will be, a popular mental association of the dealers in electrical devices with the electricity supply company.

Now, if the dealers and contractors in a given community are an up and coming lot, prosperous and happy, and if they feel that the central-station company is giving them a square deal, they must inevitably inoculate their customers, who are also the customers of the utility, with the idea that the central station is a pretty good organization to do business with, to live with and to have around the place. But if, on the contrary, the

dealers and contractors are a sorry lot, poverty-stricken and morose, who think that the central-station company regards them as blots on the face of an otherwise radiant world and is trying to eradicate them forever, then the customers of these dealers, who are also the customers of the utility, will become infected with the belief that the central station is a menace to all that is good and true and beautiful.

Electric utilities are beginning to realize that their first reaction to the perception of the need for amicable public relations was very incomplete and superficial. Publicity, paid for by the inch, extolling the patent virtues and the shining ideals of the organization and revealing the honest heart beating in the corporate body, did not effectively register in the public mind. This kind of publicity did not immediately convince the people that the corporation, hitherto often regarded as having batlike wings, a forked tail and cloven hoofs, was only playing in that disguise and was really a sweet angel of light. Good public relations are more and more becoming appreciated for what they really are—the rewards of friendliness in personal contact, of giving a measure full-up and overflowing to all men, of being "of" the community and not simply in it.

Nowhere is the true policy of a central-station company more forcefully exemplified than in its treatment of the dealers and contractors who are at once perhaps its competitors and its coworkers, and through no other channel do the virtues of the shortcomings of the utility flow so directly and so surely into the public mind. By the nature of his position the dealer must have an animus in one direction or the other, and the central station, if it is wise in its generation, will see that this animus is in the right direction.

Building Load Faster than Normal Growth

SINCE average annual kilowatt-hour sales per residential customer have come to be generally accepted by the industry as a measure of load building, it is interesting to speculate upon the possibilities in this direction and to analyze the reasons for the high figures already reached by some central-station companies. An illustration of what may be done is contained in the report of one Pacific Northwest power company that its sales this year will be 630 kw.-hr. per customer, or nearly double the national average of 365 kw.-hr. To express it as the sales manager of this company does, this is the result of building load faster than the normal growth. That is to say, an intensive and consistent drive has been made over a period of years to sell load-building appliances to increase consumption of existing consumers.

When figures such as the above are presented, the skeptical always look for the fly in the ointment, and they are justified in doing so, because full facts do not always accompany the published statements. In this case, however, there is no catch. The increase in sales is not due to air heating, because there is virtually no house heating in the territory. It is not due to a large water-heating load, because water heating accounts for only 2 per cent of the annual average. Small commercial and power business has not crept in to swell the average. The company is getting an average of about 5 cents per kilowatt-hour for residential business, so rates are not abnormally low. Electric ranges are not alone responsible, for in this regard the company has a "saturation" of only about 13.5 per cent, which is low in comparison with that of some other properties. Ranges are, however, the greatest single factor. Although range saturation is still relatively low, yet it indicates the possibilities of increasing consumption by means of this appliance. Another central-station company in the Northwest now has 16,344 ranges on its lines, or a saturation of 21.5 per cent. This year alone 7½ per cent of the company's domestic consumers have installed ranges and 34 per cent of the total number of ranges on the company's lines have been sold.

In analyzing the figure of 630 kw.-hr. a year per customer no conditions can be found that explain it away. It is due simply to a concentrated effort to build residential load of all types faster than the normal growth. Yet this company is not satisfied—its goal is 1,000 kw.-hr. per year.

What's Good for Shoemen Is Good for Utility Companies

FEWER shoes per capita are being worn in the United states this year than in 1914. The recession amounts to twenty-eight million pairs yearly, representing a loss in gross income to the shoemen of something like one hundred million dollars. To regain this loss, the shoemen, through a national organization, are about to spend a million and a half in advertising over a space of three years, or about one-half of 1 per cent of their gross expectation per annum.

The electric service industry has never suffered a loss. Year by year, through good times and bad, its gross and net revenues have mounted. Yet its costs also have mounted, to the point where the invested dollar turns laboriously once in five years. Mounted also have its opportunities. Those who compile and sift statistics tell us that the consumption of electricity is, per capita, about one-half of what has been proved to be a practical average. The shoemen to win back the fifth part of a pair of shoes per capita from a lost market spend millions of real dollars. The utilities to win a hundred per cent increase in a growing market should spend more than their time in meetings devoted to business development.

The Price of Progress in Refrigeration

VIRTUALLY the entire electrical industry today is keenly interested in electrical refrigeration. Power companies welcomed the idea with a glad cry because the domestic electric refrigerator proffers at a most opportune time a load of inestimable value to the central station. Approaching this new equipment in this spirit of enthusiasm, it was inevitable that many should plunge into the market without sufficient forethought and preparation either in their sales policies or their facilities for service. Some manufacturers also rushed in in a manner rather too headlong. Disappointments have naturally followed and the fond hopes of many executives have been seriously disturbed.

There is no cause for any discouragement, however. It must be remembered that in an electric refrigerator many fine technical problems are involved. Here in a single appliance are combined electrical, mechanical,

chemical and thermal processes of great nicety. All mechanical, electrical or absorption-type refrigerators on the market at the present time use as refrigerants certain gases such as ammonia, sulphur dioxide, methyl, chloride or ethel chloride. Some are quickly detected by odor, others not so easily. All are detrimental to health and dangerous to life if breathed in sufficient quantity. But so are illuminating gas, natural gas, oil and other vapors, and the unpleasant possibility of the leakage of a refrigerator or other troubles with refrigerating equipment must be liberally viewed in that light.

Accidents seem to be the price of progress in the development of such mechanical servants of man. Coal heaters, oil stoves and gas ranges caused many fatalities in the early days of their refinement. The use of electricity itself brought sorrow to many households when the world was just learning how to control and enjoy it. The automobile has taken a staggering toll of human life. Yet each in turn has won its place in the American market and justified its cost. New devices unfortunately bring new accidents until men discover the precautions that are needed to make them safe. There is no reason, therefore, why electrical men should be unduly disturbed by occasional unsatisfactory experience with refrigeration. The marvel is that so intricate a mechanism could have been made so effective and dependable in so short a time and in such quantity with so small a number of serious accidents recorded. What is needed now is more experience in large-scale production, selling and the servicing that is a part of it. Above all, there must be an attitude on the part of electrical men that will aid the interpretation of the rare cases of serious trouble that occur. For the public confidence in electrical refrigeration is of more importance than any detail of performance—for instance, in refrigerants.

Market Analysis Pays Its Own Way

TWO electric utility companies serving highly industrialized territories recently undertook to survey the potential field for electric heat applications in local manufacturing plants. For the first few weeks the commercial engineers who were doing this work regularly completed a certain number of reports on load possibilities, when suddenly the survey came to an abrupt stop. No reports were being turned in and no further plants were being visited. Investigation of the reason for the apparent abandonment of the load survey revealed that the sales engineers had already uncovered so many "live prospects" for electric heating equipment that they were devoting all their time to active sales work. In fact, they had completed the sale of enough commercial cooking equipment to pay the cost of the survey to date out of revenue from energy consumption. In addition, several promising openings for heat-treating operations were pending. The outcome was the employment of more men to help complete the survey while the more experienced industrial heating engineers confined all their efforts to productive sales work.

That it is extremely desirable for an electric utility to know the extent of the potential undeveloped load in its territory needs no demonstration; but despite this many companies put off making an accurate inventory of available business. Lack of men, the cost, the probability that the survey will be out of date by the time it is completed are the most usual reasons assigned for this procrastination. Almost without exception companies that have made a prospective load analysis have found that enough new business was obtained during the course of the survey to cover its cost "and then some." As a result it has been possible to take an inventory of the business possibilities in a territory and make a profit on it. Is it not evident that companies which have not yet undertaken a market analysis of their fields need have no hesitancy in doing so? Such surveys usually more than pay their way in addition to supplying the company with valuable data for the most intelligent direction of sales effort.

Relamping the Sockets in the Home

FROM detailed surveys of the wiring and lighting equipment in the residential field there are now data available for ascertaining from many aspects the revenue possibilities. In the ELECTRICAL WORLD for Nov. 28, 1925, the distribution of lamps of various wattages in the average home was presented in detail. From the data upon which that and other articles have been founded it is not difficult to determine the possibilities of relamping. Some progressive central-station companies have already materially increased their revenue by increasing the average size of lamps in the sockets of their residential customers. Many others are interested in relamping campaigns. Hence the comments which follow are interesting and valuable.

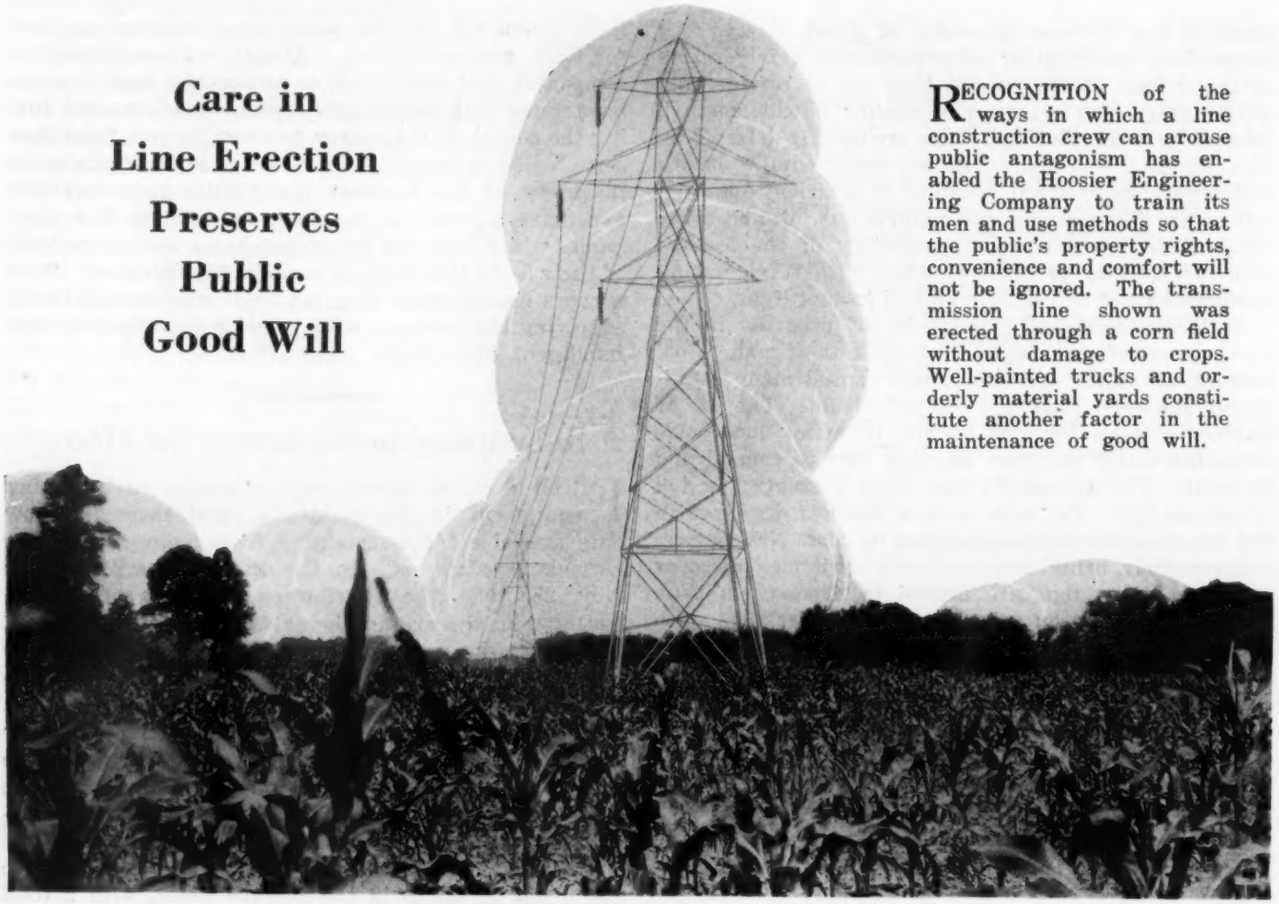
Exclusive of attic, closets, exterior and garage, there are about 22 lamps in the average home, with a total rating of 958 watts. Adequate and convenient utilitarian lighting requires at least twice this wattage. Seventy-five per cent of the lamps are 25, 40 and 50 watts in size, and these lamps are at present approximately in equal number in the average home. About 3 per cent of the total number of lamps in residences are 15-watt and about 13 per cent are 60-watt lamps. If all the lamps in the average home which are less than 40 watts in size were replaced by 40-watt lamps, the connected load would be increased 9 per cent. If all lamps less than 50 watts were replaced by 50-watt lamps, the increase in connected load would be 19 per cent. If all lamps less than 60 watts were replaced by 60-watt lamps, the connected load would be increased 34 per cent.

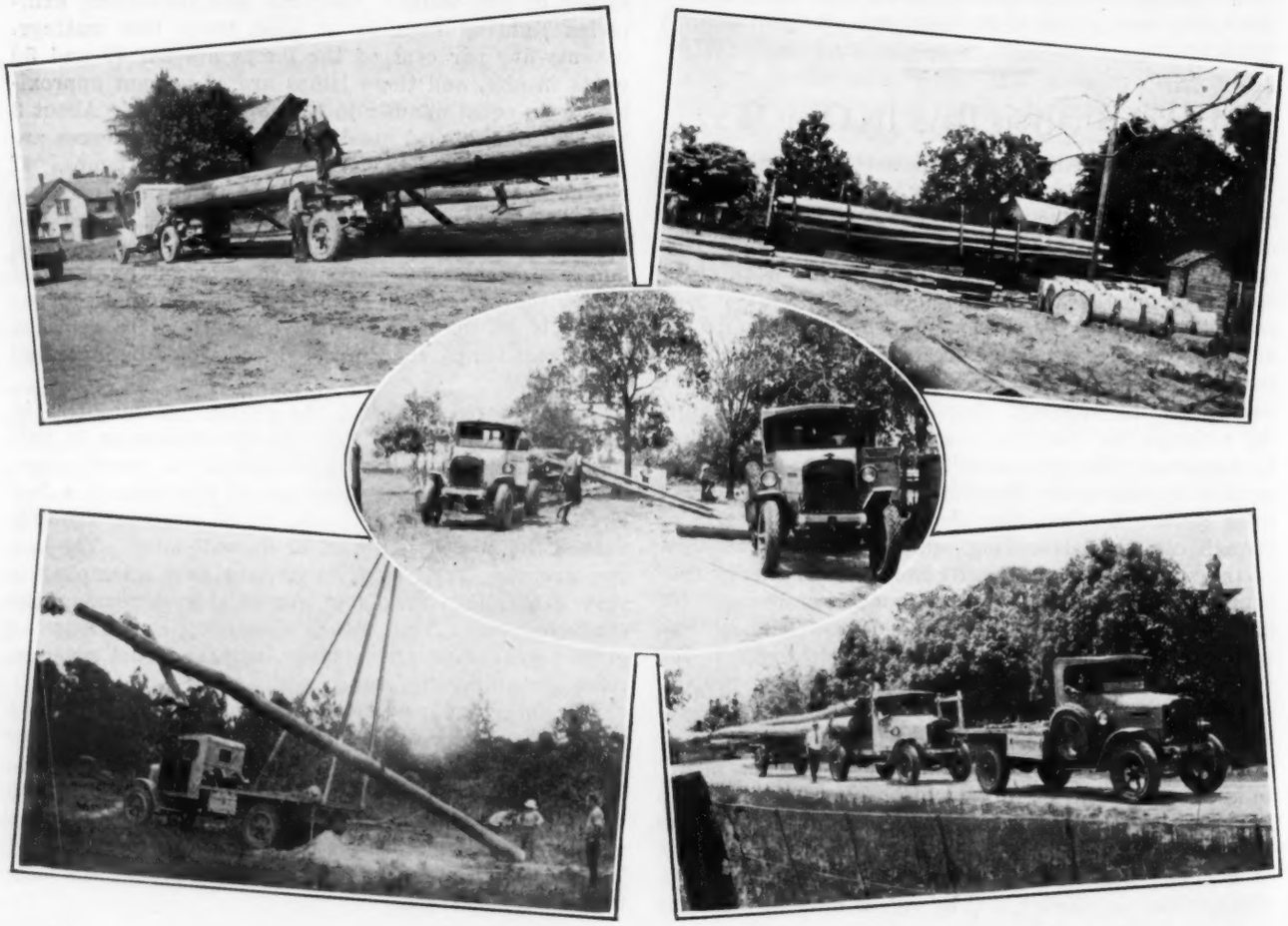
These figures represent the average possibilities in the sockets which now exist in the residences in this country, and they apply approximately to nearly every community. The exceptions are in the case of a few large central-station companies which have particularly pushed the 40-watt, 50-watt or 60-watt lamp. The last two are very rare, so it is obvious that relamping is very generally a means of appreciably increasing the connected load. That means eventually an increase in gross revenue and a very large increase in net revenue, rates remaining the same.

The foregoing percentages of increase in connected load do not include any changes in the lamps of higher wattage in each case. For example, they do not include an increase in the ceiling socket in the kitchen to 100 watts or 150 watts, where it should be. This alone would increase the average connected load 4 per cent if 100-watt lamps were installed and 9 per cent if 150-watt lamps were installed.

Care in Line Erection Preserves Public Good Will

RECOGNITION of the ways in which a line construction crew can arouse public antagonism has enabled the Hoosier Engineering Company to train its men and use methods so that the public's property rights, convenience and comfort will not be ignored. The transmission line shown was erected through a corn field without damage to crops. Well-painted trucks and orderly material yards constitute another factor in the maintenance of good will.



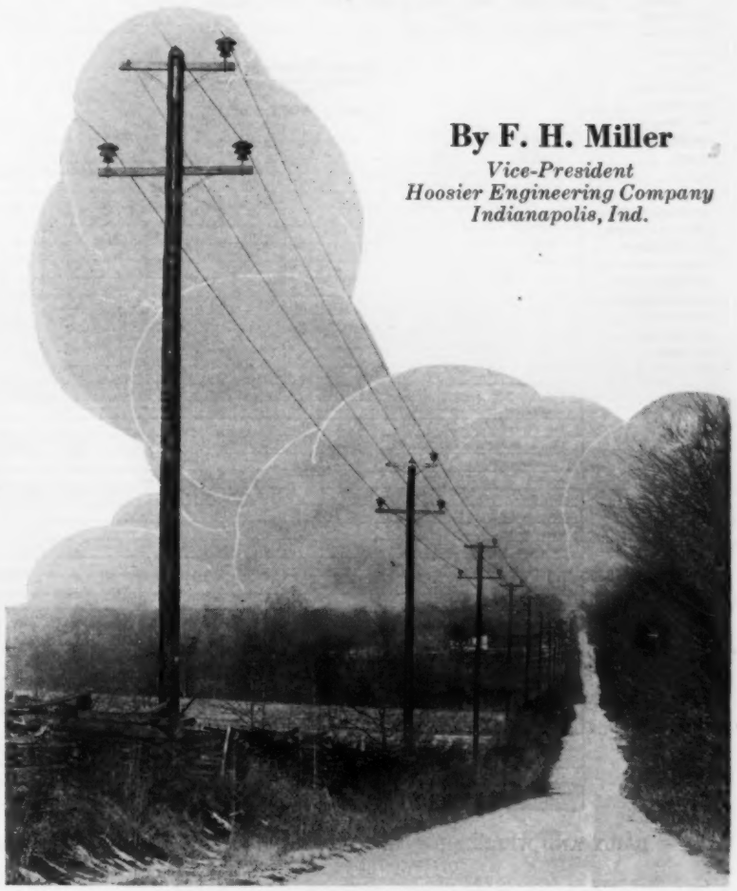


Economical Erecting Organization

for Transmission Line Construction

By F. H. Miller
Vice-President
Hoosier Engineering Company
Indianapolis, Ind.

Problems to Be Met in Organizing Construction Crews—Importance of Public Relations—Factors Affecting the Total Cost of Line



ANCIENT RAIL FENCE WAS NOT DISTURBED IN ERECTING THIS POLE LINE

THE tremendous increase in the number and magnitude of transmission line projects during the last few years has made it necessary that considerable thought be given by utilities to their erecting organizations.

In pre-war days, when labor cost was low and construction and maintenance forces were not separated, the details of erection costs were not such an important consideration. This has changed materially in recent years, especially with the larger utilities, engineering and management companies.

New transmission line construction of any considerable proportions does not usually fit in with the normal routine of standing maintenance and construction forces. On the other hand, the expansion of a standing organization to take care of a special project requires an increase in personnel, additional equipment investment and expense incident to the training of new forces not warranted by the specific work.

There is still considerable inconsistency in published cost data as to just what items are properly included under the term "erection costs." In some instances items as large as truck, tool and equipment depreciation are entirely omitted from the data, being charged presumably to some general account. In other instances direct supervision and expense incident thereto, insurance applying to workmen engaged solely on the particular project, etc., are omitted. In still others "freight" includes the unloading and handling of materials to the site of erection.

A detailed discussion of all factors offering opportunities of minimizing cost of transmission line erection is not within the scope of this article, its purpose being to direct attention only to the more important.

CHOOSING CONSTRUCTION ORGANIZATION

The proper organization of a well-chosen and carefully instructed personnel, with a definitely outlined plan of procedure, is essential. The writer believes that an organization worked out similarly to an army engineer company, with the necessary variations, is well worth looking into.

The supervisory organizations must be thoroughly instructed not only in methods of erection but in relations with the public, avoidance of injury to employees, seeing that property damage is kept to a minimum and the elimination of any likelihood of injury to the public. These matters must be impressed upon the forces under them.

Usually the choice of labor personnel is given relatively little thought when compared with the care given the purchase of materials, the engineering, etc. Construction forces are often organized on the basis of price of labor instead of ability to build a particular project.

Crew foremen should be carefully instructed and should possess more than the ordinary amount of tact, resourcefulness and consideration due to the fact that they are in constant contact with the public and that upon them, to a large extent, rests the responsibility of maintaining the public's good will.

The acts of the laborers directly reflect the attitude of the superintendent of construction. If the superintendent's instructions are definitely given to the crew foreman and if, in turn, the crew foreman makes suitable explanation of what is desired and insists upon fulfillment by his men, inspection being made systematically to see that orders are carried out, there is no question as to the outcome and proper spirit. The

Hoosier Engineering Co.
Erectors of Transmission Lines
INDIANAPOLIS

WEEKLY REPORT WORK

Job Location _____ Weekly Report No. _____

Job No. _____ Week Ending _____

OPERATION	FRIDAY	SATURDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	TOTAL FOR WEEK	TOTAL PRIOR WEEKS	TOTAL TO DATE
Poles Unloaded									
Poles Distributed									
Poles Soaked									
Poles Framed									
Holes Excavated									
Holes Shouted									
Poles Thrown In									
Poles Set and Tamped									
Anchors									
Guys									
Cross Arms Unloaded									
Cross Arms Assembled									
Cross Arms Distributed									
Cross Arms Erected									
Insulators Unloaded									
Insulators distributed									
Insulators Installed									
Wire Unloaded									
Wire Distributed									
Wire Strung									
R. O. W. Cleared									

Hoosier Engineering Co.
Erectors of Transmission Lines
INDIANAPOLIS

DAILY WORK REPORT

Job Location _____ Daily Work Report No. _____

Job No. _____ Date _____

Poles Set and Tamped—Details Below:

POLE NO.	30	35	40	45	50					POLE NO.	30	35	40	45	50				

Poles Distributed	-	-	-	-
Poles Soaked	-	-	-	-
Poles Framed	-	-	-	-
Holes Excavated	-	-	-	-
Poles Thrown In	-	-	-	-
Anchors	Men and Equipment Used			
Dead Men	-	-	-	-
Guys—Single	-	-	-	-
Guys—Double	-	-	-	-
Cross Arms Erected	-	-	-	-
Brackets Erected	-	-	-	-
Insulators Unloaded	-	-	-	-
Insulators Installed	-	-	-	-
Wire Strung	-	-	-	-
R. O. W. Cleared	-	-	-	-
Miscellaneous	-	-	-	-
	-	-	-	-
	-	-	-	-
	-	-	-	-
	-	-	-	-
	-	-	-	-
	-	-	-	-

_____ General Foreman _____ Field Auditor

PUT DIARY FOR DAY ON REVERSE SIDE

DAILY AND WEEKLY REPORTS HELP FOREMEN KEEP A CHECK ON PROGRESS OF WORK

average laborer is anxious to do his part of the work with credit, and his failure to do so is usually due to lack of instruction.

Suggestions for improvement from employees should be solicited and receive consideration.

All of these things must be considered in relation to cost. Too much stress cannot be put on the necessity of minimizing property damage in right-of-way. It is certainly of no advantage to install a section of line chiefly from a low labor cost standpoint and to have a multitude of claims for damages to property. However, this occurs frequently when foremen have not been properly instructed and trained.

The Public Relations Aspect

Such omissions as failing to replace a fence, allowing stock to enter a grain field, leaving holes open and not barricaded or unnecessarily increasing the amount of crop damage in the vicinity of a structure under erection are all very costly.

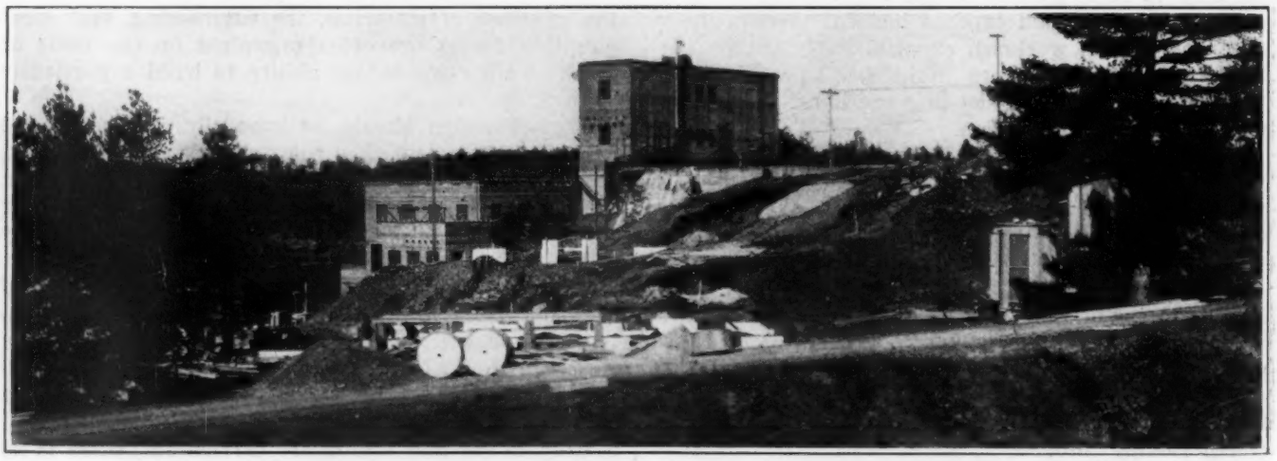
The claims made to a utility for property damage are usually exaggerated and damages are often settled on the basis of the exaggerated claims, in spite of which there often remains a feeling of resentment on the part of the property owner against the utility.

The men must be trained to watch for small omissions such as an anchor, leaving wire untied, permitting broken insulators on lines, cross-arms out of line, poles not canted, double arming plates omitted and in fact anything that would cause a return to the work. It is usually more expensive to go back over a piece of work to supply omissions and correct errors than it would have been if the entire gang loafed while one competent man did the work right in the first place. In spite of precautionary measures taken that appear superfluous, it is surprising how often minor details are overlooked or disregarded.

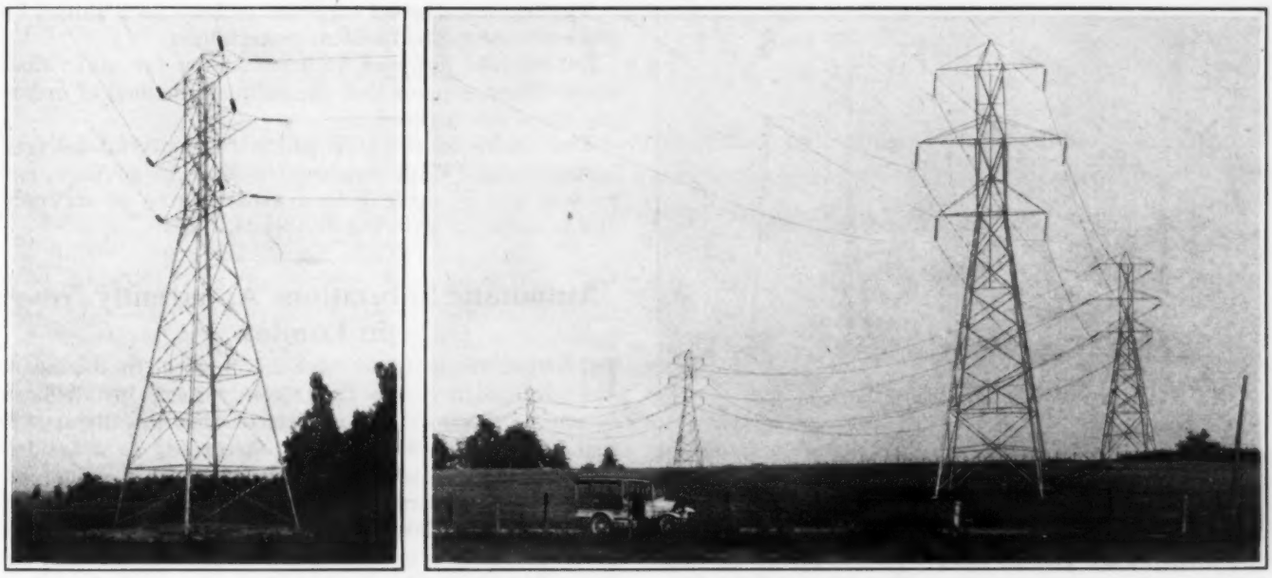
Each foreman must become his own inspector so that he may detect errors immediately. Close attention to small construction details will soon become habitual and will automatically eliminate the necessity of such minute attention. One hundred per cent perfection must be demanded from each and every workman if the quality of the work is to be above the average.

Equipment Must Fit Job

Proper equipment is essential for economical construction. The specific work to be done must be considered and equipment chosen accordingly. For instance, tractor equipment may be extremely advan-



KEEPING HIGHWAYS CLEAR IS GOOD INSURANCE AGAINST DAMAGE SUIT



NEATNESS IS ESSENTIAL TO GOOD WORK. NOTE ABSENCE OF TRASH ON GROUND

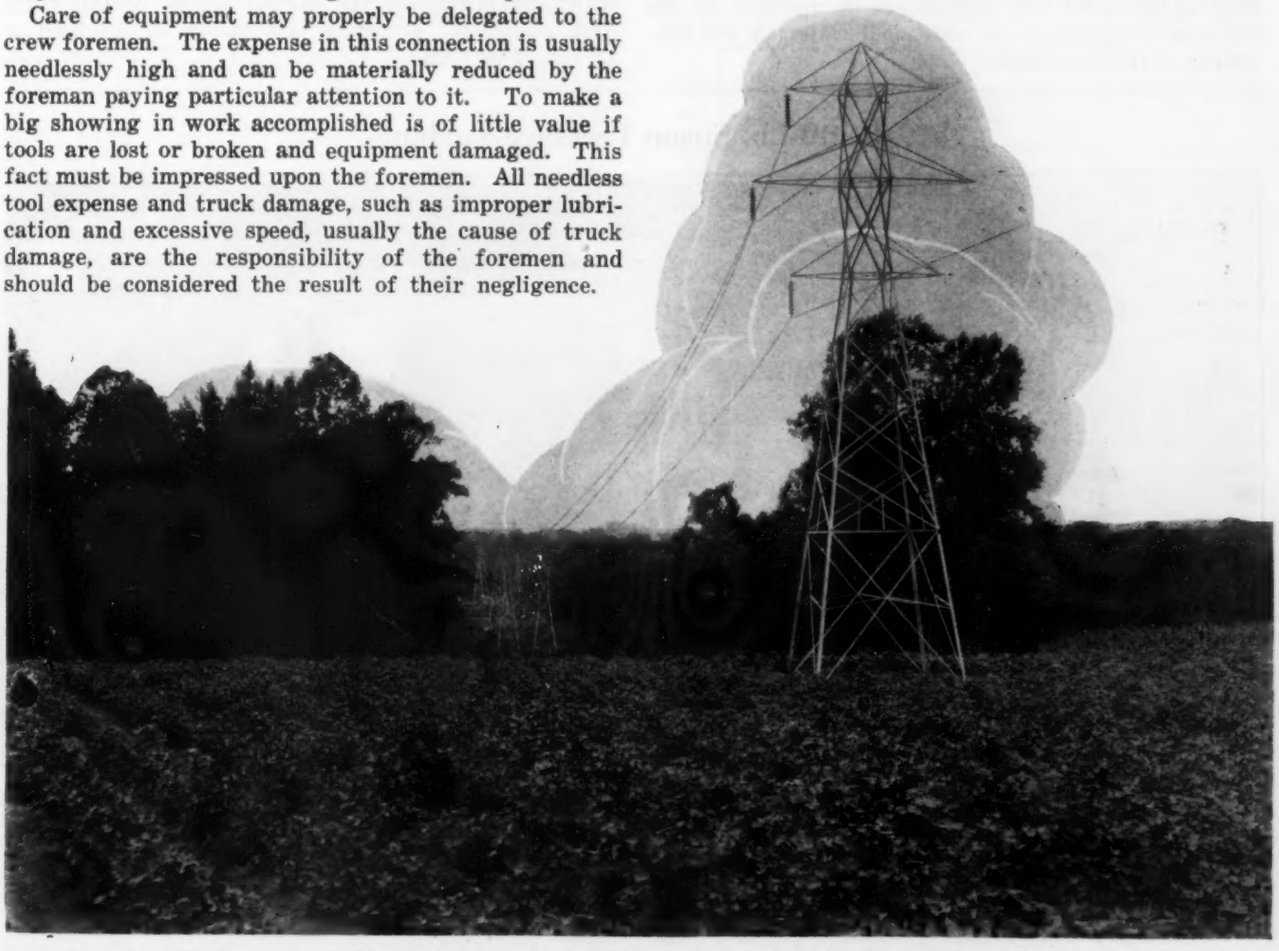
tageous on one piece of work, but teams may be far more economical on another piece of work.

The capacity of trucks most economical for the job must be chosen with respect to the limiting factors of bridge capacity and road conditions encountered.

Equipment should be sufficient and adequate, and if new equipment is to be used, it should be purchased in ample time to have it on the ground when required.

Care of equipment may properly be delegated to the crew foremen. The expense in this connection is usually needlessly high and can be materially reduced by the foreman paying particular attention to it. To make a big showing in work accomplished is of little value if tools are lost or broken and equipment damaged. This fact must be impressed upon the foremen. All needless tool expense and truck damage, such as improper lubrication and excessive speed, usually the cause of truck damage, are the responsibility of the foremen and should be considered the result of their negligence.

Probably one of the most common sources of uneconomical erection comes from starting construction work before engineering and purchase of right-of-way have been completed or at least sufficiently advanced to eliminate the possibility of interfering with the erecting organization. Delays occurring from waiting on right-of-way, necessitating jumping sections with the con-



TRANSMISSION TOWER ERECTED IN COTTON FIELD WITHOUT DAMAGE TO CROP

UNFINISHED WORK SHOULD ALWAYS BE LEFT SECURE AT NIGHT

struction crews, are always expensive and the computation of losses is difficult.

Another source of uneconomical erection is when it is necessary to order materials by estimate rather than from a definite knowledge of the territory over which the line is to be built, obtained through detailed engineering. As a general rule in such cases, shipments of materials are made to the wrong places, the engineering is hurried to a point where it is not accurate and usually requires more or less duplication of erection or the ordering of quantities of additional materials not contemplated in the estimate.

The increased speed supposed to have been gained by the estimate method seldom materializes.

Oftentimes, however, it is necessary for other than construction reasons that the estimate method of ordering materials be used.

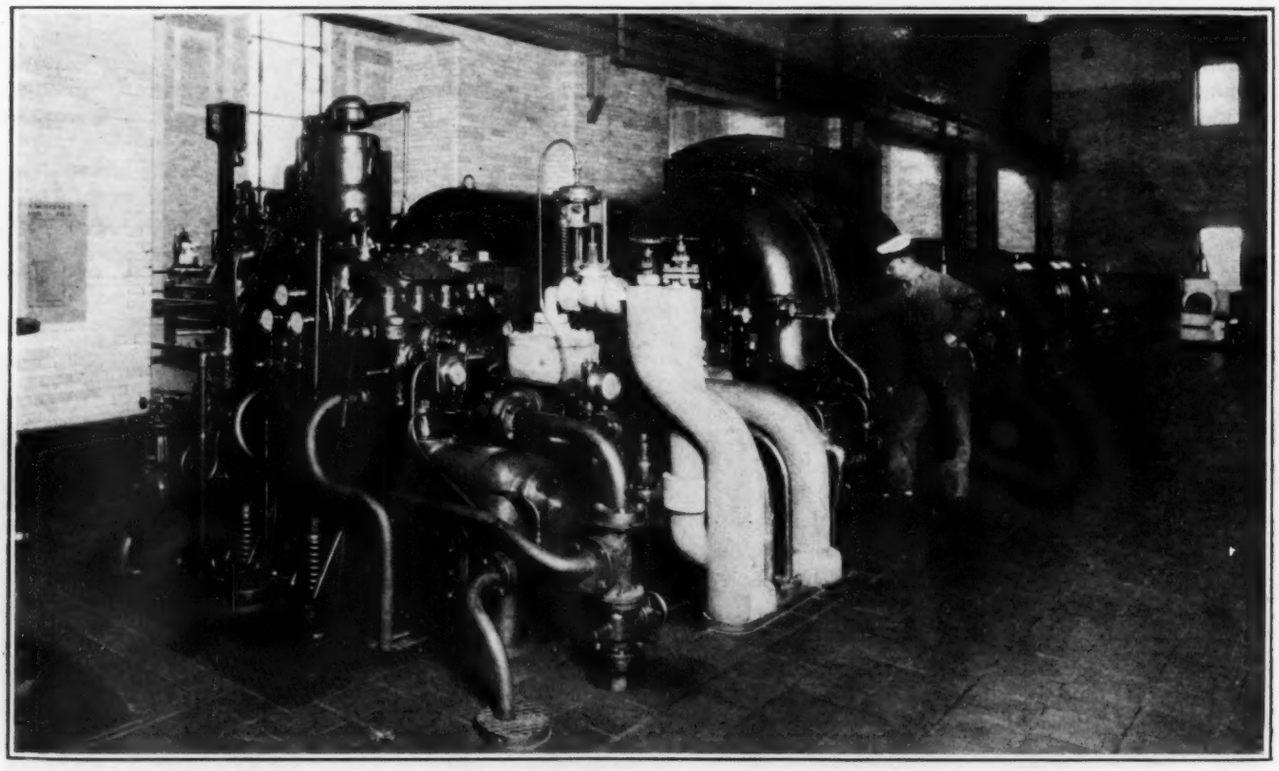
The choice of shipping points for material delivery is important. With engineering done in advance, car routing can be made with a great degree of accuracy and it certainly pays big dividends.

Automatic Substations Apparently New in London

UNDER the gardens of Soho Square, in the heart of London, there has recently been installed an automatic 2,000-kw. substation feeding the direct-current network in this district. According to a London correspondent, this is an innovation for London, although such stations are becoming quite common in the United States. This underground equipment, which has just been officially opened, is a substation of the Charing Cross Electricity Supply Company.

When increasing load begins to cause a drop in the network voltage, relays start one of the four rotary converters, the remaining machines being started in sequence as required. Load decrease automatically shuts down the machines one by one. All of the equipment has been specially designed so that it can be moved into or out of the substation through a manhole measuring only 5 ft. by 3 ft. The equipment has been supplied by the Metropolitan-Vickers Electrical Company, which, according to the correspondent, installed the first completely automatic substation in England at Liverpool in 1922.

1,200-Lb. Steam Pressure Turbine



CHARLES LEAVITT EDGAR STATION OF THE EDISON ELECTRIC ILLUMINATING COMPANY OF BOSTON

Stimulating Power Business

What One Central Station Has Done and Is Considering to Secure the Maximum Business Without Neglecting the Customer's Interests—A Novel Salary-Commission Schedule Versus Straight Salary

VALUABLE as they are to sales work, the classification of markets, analysis of industry requirements, study of channels of approach, compilation of experience data and proper sales organization and functioning are not alone sufficient for the greatest development of a lasting power business, according to one power company in the Middle West, which has employed all these methods for a number of years. Despite the fact that this company has increased its connected power load and energy consumption 33 per cent and 20 per cent per year respectively by these methods, it considers that power business can be obtained even more rapidly if additional stimulus is offered. It has set its finger on the method of compensating salesmen as one of the remaining factors to adjust, but it recognizes that the stimulus must not create conditions that will offset the friendly relations now existing with its customers.

Need of Change in Compensation

"Shall a salary-commission schedule of the nature described herein be adopted, or will it be better to remove restrictions to maximum salaries that can be paid salesmen?" is the question the company is considering. Some change in compensation is necessary to retain in the sales department men who have developed to the point where they will command a greater salary than the present limit. Now such salesmen in order to be retained must be transferred to other occupations in the company permitting more salary—a condition that exists in many companies. As a result the sales department has continually acted as a training department which loses its best men to other departments when by affording an incentive for longer continuance in the sales department it might retain these men for the all-important work of securing business.

Straight salaries have always been paid so far, and the men have been drilled into developing business that will be lasting and be a nucleus for greater business. As an indication that the salesmen are not merely interested in signing contracts, it can be said that about 60 per cent of each salesman's time is devoted to servicing, advising and keeping customers friendly. Among various functions which the name implies, servicing has included eliminating delays in starting operation with purchased power that might otherwise result due to causes extraneous to the company's own organization. Expenditure of time devoted to customer service has been considered well worth while, because it forestalls complaints, encourages customers to seek utility advice regarding uses of electric service, leaves an open door to power salesmen when new applications can be demonstrated, enables the utility to secure operating experience that can be applied elsewhere, and most important of all, convinces the customers that the utility is interested in more than the immediate revenue. As a consequence the growth of the individual customer's consumption had increased much more rapidly than it might otherwise.

By maintaining a careful watch of local business conditions, the power sales department has for years been able to direct intelligently the concentration of sales attention. For example, when business is good, it knows that the customers are amenable to arguments to spend money for new applications, and when business is declining, it knows that the industries will lend a more receptive ear to applications that will reduce the cost of production and hence increase the margin of profit. This practice alone enables the department head

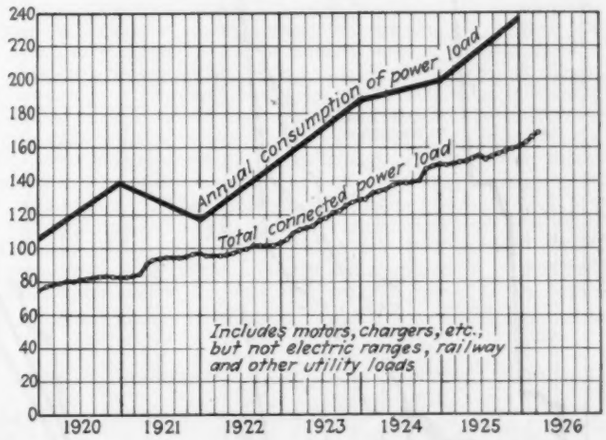


FIG. 1—INCREASE OF TOTAL CONNECTED POWER LOAD AND ANNUAL CONSUMPTION OF ENERGY

to judge when salesmen's time can best be spared for servicing and when it can better be utilized in securing business.

Must Retain Advisory Service

As one basis for judging the capabilities of individual salesmen and also for stimulating their sales efforts the company has also kept and posted records of individual salesmen's accomplishments, indicating the number and magnitude of contracts signed, classified as to new or additional business. Although such records have been found to be helpful, they do not represent a real yardstick by which to measure salesmen's ability, as they do not take into account the desirability of the load, ease of securing, saturation of the territory and amount of servicing and advice necessary, nor the attitude of the customer after the contract has been signed. Many less tangible factors have to be considered by the head of the power sales department in measuring the relative value of the men and in assigning them to work to which they are best adapted and in which they are most valuable to the company.

Although the accompanying schedule has been developed on a basis that it is hoped will avoid many of the weaknesses of a commission schedule, the company is

still undecided whether it, or increasing the maximum limit to salaries paid salesmen, will be more effective in the long run.

The salary-commission schedule does not eliminate entirely the tendency which a salesman, operating under it, might have to secure the maximum commissions regardless of the effect on the customer or the after effect on the company. Nor does it completely assure the company that the salesman will give as much attention to servicing and advising the customer. However, by adjusting the commissions and salary portions of the schedule so the salary will constitute 50 per cent

The Power Sales Salary-Commission Schedule

Foreword.—This company pays its power salesmen for their directed services, with the general aim of educating present and prospective customers to the best use of its service and thus retaining and increasing the profitable business. Directed service includes the establishment and maintenance of friendly relations with customers, through giving them engineering service of various kinds, caring for their troubles and complaints, acting as their representative and at all times using the best methods of obtaining and retaining business.

To engender initiative and increase the immediate compensation for new business obtained, a small commission schedule is hereby established in addition to a nominal salary. This schedule partly recognizes both the desirability of the business and the sales obstructions encountered in securing it.

Conditions of Cancellation. — This schedule is subject to cancellation, revision or change without notice.

An employee leaving the company's service or being transferred from power sales department for any reason whatsoever forgoes and cancels his claim for commission upon any business not secured previous to his having left the company or department.

Applicable to Power Sales Department Only.—This schedule applies only to men who have been given the title of power salesman, power specialist, assistant power salesman or assistant power specialist and who are working on business assigned to them.

Commission Due. — Commissions will be paid by separate payroll checks as soon as possible after such commission has been approved by the power engineer.

Commissions (See types of contracts).—Commissions will be paid on new business as follows (see appended classifications): Class 1, 5 cents per horsepower; class 2, 10 cents per horsepower; class 3, 15 cents per horsepower; class 4, 20 cents per horsepower; class 5, 25 cents per horsepower.

Old-Established Business Contracts. —Because it is more difficult to "sign up" a customer who has a heavy investment in isolated-plant equipment than to obtain similar business from a customer who is going to build a new plant or remodel an old one already electrified, the classification used in figuring the salesman's commission for such "old business" will be one class higher than shown in the accompanying classification.

Auxiliary-Service Contract. — In calculating business for "auxiliary service," the contracted-for kilowatts, converted to horsepower, shall be con-

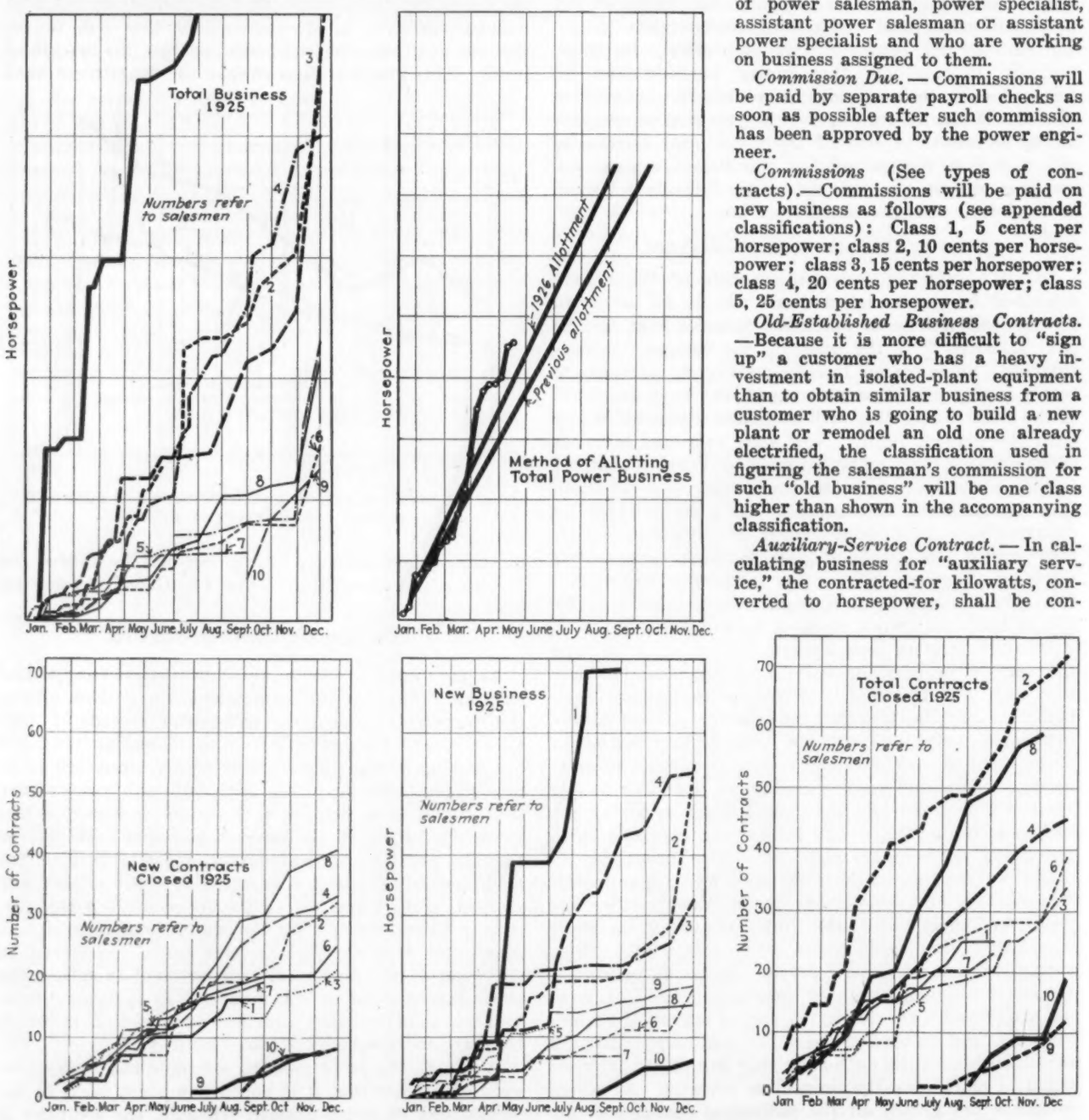

Total Business 1925
Numbers refer to salesmen
Horsepower
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
1926 Allotment
Previous allotment
Method of Allotting Total Power Business
New Contracts Closed 1925
Numbers refer to salesmen
Number of Contracts
New Business 1925
Numbers refer to salesmen
Total Contracts Closed 1925
Numbers refer to salesmen

FIG. 2—GRAPHICAL RECORDS OF SALESMEN'S PERFORMANCE ARE VALUABLE BUT NOT A COMPLETE YARDSTICK

sidered as 55 per cent of the connected load used, except that in no case will such connected load of a plant be considered as more than one-half of the total connected load of the customer.

If the "auxiliary service" is superseded by a regular contract, the commission on the succeeding regular contract shall be the difference between the commission figured for an "auxiliary contract" and that which would accrue on a regular contract.

Temporary-Service Contract. — All "temporary-service" contracts will be considered as class 1 business and will carry no penalization when disconnected.

Successor Contract.—All "successor contracts" will be considered as class 1 business. By "successor" is meant the new party who takes possession of an old customer's plant and purchases service; it does not include a change of business, in name only, or when a receiver takes possession.

Additional Business Contract.—When more than 5 hp. is added to existing customers' loads, the power salesmen will receive a commission of 2.5 cents per horsepower. To obtain commission for additional business, the power salesman must claim credit therefor within six months subsequent to the installation of additional load.

Where existing customers make additions due to special efforts on the part of a power salesman or power specialist, either will, on approval of the power engineer, receive commission for the additional business under the classification in which the plant would fall for new business.

Additional Lighting Business. — Because of the importance of co-operation between the power sales and the lighting sales departments, a commission will be paid on additional lighting load where a power salesman has been instrumental in assisting the lighting sales department to obtain added lighting business in industrial plants which have been assigned to him. Upon the approval of power engineer, this added lighting business will be classified under the same classification as the particular plant would be for new business.

Specialized Power. — Because of the importance of co-operation between power salesmen and power specialists this schedule has been designed with the intent of paying commissions to both the power salesman and power specialist co-working in obtaining any particular piece of business.

Where a power specialist has negotiated with a customer concerning the installation of a specialty of his line, the specialist will have a similar commission to that which is paid the salesman.

The first application of "specialized power" of any particular line on a customer's promises shall be considered as equivalent to new business and commission will be paid on it as such, even though the customer has previously been using purchased service.

Determination of Business on Which Commission Will Be Paid.—Commission will be paid only on business actually connected to the company's lines as shown by meter-book records or as otherwise specified by power engineer. In the case of new customers, all business connected to the company's lines for a period of six months subsequent to date of initiation of service will be classed as "new business," and commission will be paid thereon as that load is connected.

Penalization.—When a customer installs a substitute source of power and discontinues purchased service, the power salesman and power specialists interested will be penalized 5 cents per horsepower for business thus lost.

When the entire load is disconnected, the horsepower will be figured the same as in the case of connection, but when the customer retains "auxiliary service," the horsepower for penalization will be figured as the difference between "regular-service" and "auxiliary-service" horsepower. (See Auxiliary Service Contract.)

Time Limit.—Salesmen or specialists will be paid a commission only when one of their group of men assigned to that customer has called on the customer within 60 days of the time of receipt of the contract and the call has been noted on their weekly sales reports.

Commissions for Power Salesmen, Power Specialists and Assistants.—Where there is a power salesman and assistant or assistants, and a power specialist and assistant or assistants, commissions will be divided so that the power salesman who is in charge of a district, or the power specialist heading a specialized division, will receive 60 per cent more than the assistant or any of the assistants. Thus where there is one assistant, the power salesman or power specialist will receive 61.5 per cent and the assistant 38.5 per cent of the commission for the total business which the two secure. With two assistants the salesman or specialist will receive 44.5 per cent and both assistants will receive 27.75 per cent. Penalties to be prorated similarly.

Classification of Industries for Determining Commissions

Class 1

Cemeteries.
Department stores.
Feed mills.
Fire pumps.
Hospitals.
Natural ice cutting and shipping manufacturing.
Therapeutic lamps.
Unclassified.

Class 2

Automobile assembling.
Builders' material manufacturing.
Butchers.
Bottling works.
Calendar manufacturing.
Canning (seasonal).
Car wreckers.
Clothing manufacturing.
Coal and lumber yards.
Cold-drawn steel shapes manufacturing.
Cold-pressed steel and stampings manufacturing.
Concrete block manufacturing.
Copper and brass smelting.
Crushed stone quarry manufacturing.
Excavation contractors (temporary).
Extruded brass manufacturing.
Farm business.
Foundries.
General manufacturing.
Gravel pits.
Grocers (retail and wholesale).
Heavy sheet steel manufacturing (tank cars, boilers, etc.)
Ice cream manufacturing.
Warehouses.
Wire fencing and screening manufacturing.
Steel-melting furnaces.
Junk dealers.
Magnesite grinding manufacturing.
Mining machinery manufacturing.
Moving picture studio.
Moving picture theater.
Newspaper and job printing.
Oil-filling stations.
Overall manufacturing.
Photographers' lamps.
Plumbing and pipe fitting.
Public garages.
Railway equipment foundries.
Railroad signal stations.
Sheet metal manufacturing.
Shoe repairing.
Small automobile accessory manufacturing.
Small machine shops.
Spot and butt welding manufacturing.
Steel foundries.
Steel window manufacturing.
Stone cutter manufacturing.
Telegraph office.
Telephone office.
Tin can manufacturing.
Weather strips (metal manufacturing).
Copper and brass melting furnaces.

Class 3

Aluminum spinning manufacturing.
Arc welding.
Bakeries.
Biscuit manufacturing.
Bottle manufacturing.
Candy manufacturing.
Coal mining.
Electroplating.
Electrolytic products manufacturing.
Enamel products manufacturing.
Flour mills.
Grain elevators.
Leather manufacturing.
Paint and ink manufacturing.
Plastic floor and wall material manufacturing.
Railroad pumping stations.
Railroad shops.
Railroad yards.
Rubber goods.
Schools.
Shoe manufacturing.
Storage battery manufacturing.
Ventilating and heating blowers.
Gray iron melting furnaces.
Moderate temperature furnaces.

Class 4

Breweries.
Brick plants.
Cereal manufacturing.
Chemical manufacturing.
Dried food manufacturing.
Envelope manufacturing.
Furniture manufacturing.
Gas manufacturing.
General oil refineries.
Glue manufacturing.
Hot-pressed steel manufacturing.
Hotels.
Ice plants.
Knitting and spinning mills.
Laundries.
Lubricating oil refineries.
Macaroni manufacturing.
Match manufacturing.
Milk condensing and bottling manufacturing.
Office buildings.
Packing houses.
Paper manufacturing.
Paving brick.
Refractory brick manufacturing.
Rerolling mills.
Steel forging.
Steel rolling mills.
Tanning.
Textile mills.
Tool steel manufacturing.
Village pumping.
Wallpaper printers.
Wood-working manufacturing.

of the salesman's income, sufficient control of the salesmen can be retained so that they can be shifted from unsaturated to more saturated territories, from easy business to more difficult business and the like, depending on exigencies of the occasion. Furthermore, by explanation to the salesmen of the operation of the schedule, it is believed that proper selling and adequate customer attention can be retained, inasmuch as the obtaining of additional business is influenced to a great extent by the previous treatment the customer has received. The classifications of businesses with different commission rates for each class is intended to remove the objection to some commission schedules that do not take into account desirability of load and ease of securing it.

From the executive viewpoint it does not matter much what the specific form of compensation is, provided it secures business at a low unit cost, is agreeable to the salesmen, retains the customer's friendship and does not produce individual incomes greatly out of line with those received for other activities of equal value in the company. From the salesman's viewpoint, a straight salary dependent upon ability has many attractions over a straight commission basis, owing to the fact that some uncertainty always exists regarding incomes from commissions, especially when a salesman must devote considerable time to servicing and advising. By removing this uncertainty, salaries can undoubtedly be made lower than total individual commissions and there could be a closer control of the salesman's activities, although there is some doubt as to a relative stimulus of equivalent salaries and commissions.

The accompanying salary-commission schedule retains many of the advantages of a straight salary and also of commissions, but so far the inclination of the company developing it is to adhere to straight salaries with less restriction on the maximum salaries that can be earned. However, the company does consider the accompanying salary-commission schedule as being the best now seen, if it is ever found desirable to adopt a commission form of compensation.

British Scientists Discuss the Trend of Development in United Kingdom

AT THE recent annual conference of the British Association the engineering section was presided over by Sir John Snell, whose official position as chairman of the Electricity Commissioners of Great Britain enabled him in his presidential address to speak with authority as to the trend of electrical developments in the United Kingdom.

Britain, Sir John maintained, may be said to have been the pioneer in the public supply of electricity. The first legislation actually dated from 1882, but effectively only from 1888. An electrical industry has grown up in Britain by authorized generating plants (excluding railways and private plants), in which alone more than $1,000,000,000 has been expended within 37 years. Far too little credit, Sir John said, has been given to the pioneer work of Dr. Ferranti, who was the first to advocate generation on a large scale and transmission at high tension over an extensive area of supply. It was he, in fact, who initiated the system at Deptford, England, necessarily limited to single-phase current in those early years. The principles now generally accepted were enunciated by him many years ago.

At the present time the amount of electricity generated in Britain, omitting privately owned generating stations, amounts to about 7,000,000,000 kw.-hr. annually, of which 5,069,000,000 kw.-hr. is sold by authorized plants, the remainder being required for railway and street-car traction. The average yearly load factor on units sold by the authorized plants throughout Britain today is under 25 per cent.

In recent government publications it has been estimated that the output in Britain within the next fifteen years may reach a total of 21,000,000,000 kw.-hr., or an even higher figure if the electrification of railroads proceeds rapidly. Taking all factors into consideration, and assuming that the population at the end of the next 25 years will have grown to 50,000,000, and that the methods and extent of distribution will have advanced and developed—coupled with a reduction in the cost of appliances resulting from scientific and commercial improvement and greatly increased scale of manufacture—the total output for domestic requirements, including residential premises, shops, offices and public places, may be estimated at not less than 20,000,000,000 kw.-hr., with a maximum load of 8,000,000 kw. The industrial demand should be about the same as the domestic, and that for railway traction 7,000,000,000 kw.-hr., making a total of 47,000,000,000 kw.-hr., involving a load of 19,200,000 kw.

Coal Is Chief Power Source

It is clear, said Sir John, that the bulk of this power will have to be derived from coal, and this suggests that efforts must be concentrated on a reduction of the consumption of coal per unit generated. Assuming that the average price of coal (of 10,500 B.t.u. value) delivered to the generating stations throughout the country is $5 per ton, it is safe to predict that the average price at which electricity should be available in the next few years would be under 1.8 cents per kilowatt-hour.

If the proposals now before Parliament for the coordination of generation throughout Britain materialize, the majority of the existing undertakings will be able to purchase electricity in bulk at a considerably lower price than that at which they can at present generate it in their own stations, and they will thus become distributing organizations only.

T. M. Kennedy followed Sir John Snell with a discussion of some of the questions which arose in this connection. He said that the total capital invested in electric supply at the end of 1924-25 amounted to $970,000,000, of which 54.6 per cent, or $530,000,000, had been invested in the distribution side of the system. From the capital point of view, therefore, the distribution side is more important than the generating side. With co-ordinated generation in the future it seems probable that the capital spent on distribution will amount to a still greater percentage of the whole than is the case at the present time. The number of kilowatt-hours sold per pound of capital invested tends to become steady at about 48. An investigation made on that assumption revealed the fact that the distribution side had in 1925 an invested capital of $530,000,000, with a total revenue of approximately $210,000,000. Out of this revenue the distribution undertaking has to pay $130,000,000 to the generating authority for its raw material (i.e., electricity in bulk). This emphasizes the need of framing attractive tariffs to increase consumption and reduce the prices which have to be charged for energy.

An Interview with

Gerard Swope

President National Electrical Manufacturers' Association

On the Topic

Why Electrical Manufacturers Organized

New Association Brings Unity in Effort and Activities—Affords a Constructive Agency to Help Industry—Statistics and Cost Accounting Immediate Objectives—Committees Appointed and at Work

A NEW organization of the electrical industry was launched in the early part of October. It is called the National Electrical Manufacturers' Association and an announcement of committee appointments last week indicates that it has started to work on a definite program.

Very naturally all branches of the electrical industry welcome the new arrival with a great deal of curiosity. Why was this association formed and what will it try to do? These are typical questions heard in the industry, and a representative of the ELECTRICAL WORLD has sought the answers from Gerard Swope, president of the new association.

"What is the National Electrical Manufacturers' Association?" was asked Mr. Swope as an introduction to more detailed queries. He replied: "It is an organization consisting of 270 leading electrical manufacturers who have a gross annual business in excess of $1,500,000,000. It is the outcome of several years of careful study, but resulted quite directly from the merging of the Electric Power Club, the Associated Manufacturers of Electrical Supplies and the Electrical Manufacturers' Council. The association ranks as a trade association, new members are elected by ballot and dues are collected from the members in the usual manner."

"What is the form of organization?" was then asked.

"The association as now organized consists of the usual executive officers," stated Mr. Swope. "Further, there are three divisions of the association, each headed by a vice-president of the association. At present these divisions and officers are: Policies Division, Clarence L. Collens; Apparatus Division, J. M. Curtin; Supply Division, D. H. Murphy. The board has indorsed a proposal to form a radio division, and other divisions may be formed if this procedure becomes advisable in the future.

"From the board of governors several committees have been formed. These committees are thought to be quite stable with respect to their fields of activity, and thus continuity of effort should be achieved. At present, the committees and their chairmen are as follows:

Policy Committee ..... Gerard Swope
Standards Committee:
Supply Division ..... C. A. Bates, chairman
Apparatus Division ..... A. H. Moore
Casualty and Fire Prevention Committee:
Supply Division ..... D. H. Murphy, chairman
Apparatus Division ..... T. E. Barnum
Finance Committee ..... H. B. Crouse
Law Committee ..... C. H. Strawbridge
Membership Committee:
Apparatus Division ..... F. S. Hunting, chairman
Policies Division ..... Shiras Morris
Supply Division ..... J. F. Kerlin
Program Committee:
Policies Division ..... Gen. O. H. Falk, chairman
Supply Division ..... H. D. Hawks
Apparatus Division ..... F. M. Kimball

"From the policy committee several sub-committees have been formed. These with their chairmen are as follows:

Committee on Policy Relations with Other Organizations ..... Clarence L. Collens
Committee on Department of Commerce ..... C. H. Strawbridge
Committee on Underwriters' Laboratories ..... S. L. Nicholson
Committee on Legislation ..... B. E. Salisbury
Committee on Promotion of Codes, Statutes and Ordinances ..... S. L. Nicholson

"The final organization of the association has not been completed in every detail, but sufficient has been done to start the constructive activities for which the association was formed. The names of the several committees give some idea of the completeness with which matters of interest to the electrical manufacturers are being studied, and there is sufficient flexibility to permit the organization to change to meet new situations that may arise."

REASONS FOR THE ORGANIZATION

The new organization is thus outlined as a comprehensive association of electrical manufacturers with a unified control of work which will benefit the members, but to clarify the situation completely Mr. Swope was asked, "Why was this organization formed?"

Mr. Swope replied: "The new association unites in one body the fine traditions established by the member bodies which existed heretofore as separate organizations. These older associations made many notable contributions to industry, and the unity and solidarity inherent in a single national organization will enable them to continue their work more effectively and with more unity of purpose. Also, I believe, co-operation with other national electrical organizations will be more effective by reason of the new organization.

"Each branch of the electrical industry has one ultimate purpose, and this is to influence the wider use of electricity and electrical apparatus because this makes for greater comforts and conveniences in the homes and increased efficiencies in the workshops. The electrical manufacturers think that a solid front will

enable them to help bring about these desired ends and will enable them more quickly and efficiently to realize upon the wonderful opportunities that exist in the electrical industry.

"The electrical manufacturers believe they need this organization in order to do a better job. They think this organization will enable them to bring about many improvements in the electrical industry such as are set forth in the constitution. These are:

To further the interests of the members in manufacturing, engineering, safety, transportation and other industrial problems;

To promote the standardization of electrical apparatus and supplies;

To collect and disseminate information of value to members or to the public;

To appear before legislative committees, governmental bureaus and other bodies in regard to matters affecting the industry; and

To promote the spirit of co-operation among the members for the improved production, proper use, and increased distribution of electrical apparatus and supplies.

"The electrical manufacturers' branch of the industry has become so large and complex in its activities and in its internal and external relations that this association is a logical step of an evolution in organization. It eliminates lost motion, establishes responsibility, secures unity and brings to a focus the interests of all electrical manufacturers."

"What do you consider the most important tasks immediately before the association?" Mr. Swope was asked after he had outlined the major reasons for founding the new organization. He replied very positively: "In my opinion the greatest immediate good will result to electrical manufacturers from this association if it brings about the tabulation and dissemination of industry statistics and secures the adoption of a uniform cost accounting system by all manufacturers. Statistics and cost accounting are fundamental to the intelligent conduct of any business. An essential requirement for successful management today is prompt and accurate information on available business and market conditions. Another essential is a knowledge of costs of manufacture. These two business aids arm an executive with the tools for doing business successfully. An organization such as this permits the members to co-operate in the compilation of these data for the benefit of all. Many associations outside of the electrical industry are doing this, and their efforts have the approval of the Department of Commerce."

"But is this type of activity legal?" was a question which the work of the Department of Justice brought to mind.

"Many people believe that the sole aim of any trade association is to fix prices and restrain competition," replied Mr. Swope. "So every effort of a trade association to improve conditions in its industry is judged by this ill-founded conviction. The Supreme Court in two recent cases recognized that the laws of economics were not intended to be subverted by restrictive judicial decisions. The court realized that the possession of complete information by all the members of an industry may tend to stabilize prices, and it held that the fact that these statistics were collected by an association did not make them illegal so long as they were available not only to manufacturers but also to the public.

"According to eminent legal opinion, trade associations may openly and legally do certain very constructive things. They can engage in legislative activities looking toward laws that will benefit the industry and against laws which will restrict the industry. They can standardize nomenclature, sizes, ratings, capacities and types of equipment. They can inaugurate through the Department of Commerce activities looking toward simplification—that is, cutting down the number of different sizes and types of equipment. They can work out and put into effect uniform cost accounting. Credit information is another legitimate activity of a trade association, as is an information bureau whose object is to give the public information about the industry. Freight rates and general traffic and transportation problems can be handled, and the association can conduct commercial or educational researches for the benefit of the industry.

"But the collection of industry statistics is one of the great tasks of a trade association. These statistics must be made available to the public as well as to the members of the association and must conform to certain restrictions, but not to a degree where their benefit to the industry is impaired. Statistics as to production, quantity produced, shipments, sales, orders received, unfilled orders on hand, stocks on hand, and of employment can be collected and disseminated.

"In this association we have recently asked all members to contribute their bit toward the start of a statistical service. It is intended to begin simply by asking for monthly reports of shipments and stocks on hand in the fewest classifications. All data from individual companies will be held confidential, and only consolidated totals will be made public or given to members. I believe the electrical manufacturers will co-operate in this work and that this first step will mark the initiation of a very constructive activity for the benefit of all members."

The interviewer then asked Mr. Swope whether he believed the new association should take into its fold all electrical manufacturers. He replied: "My personal opinion is that best results will be attained if all electrical manufacturers are part of this organization. But in some cases difficulty arises because some manufacturers are customers of other manufacturers. We have not worked out a solution to all problems of this character but are developing our association on the general premise that all electrical manufacturers have a place in this organization."

In the past the separate manufacturers' organizations have often conducted co-operative work with other branches of the electrical industry directly. Mr. Swope was asked about the procedure in future and replied: "When any matter is of mutual interest to any division of our association and another association or organization in the electrical industry, the procedure in future will conform to the new association rules in that the co-operative work will be carried on by an official committee of the National Electrical Manufacturers' Association. This procedure will be followed, also, in the conduct of negotiation with any group outside our own association. This will help greatly in unifying our co-operative work and in the maintenance of a consistent policy with respect to matters of interest to ourselves and others."

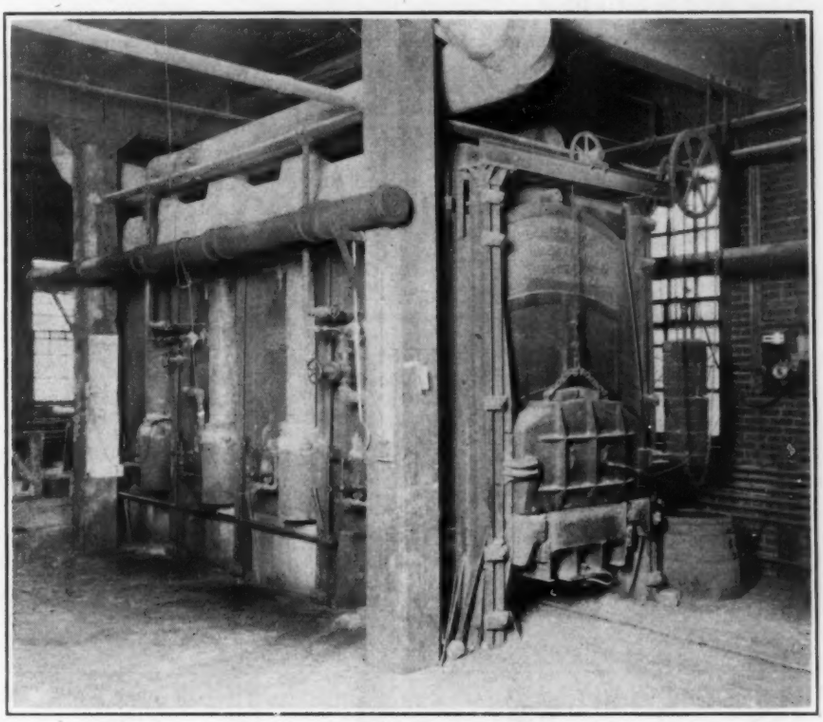
In conclusion Mr. Swope stated that the new association is a constructive step for the benefit of the whole electrical industry as well as for the benefit of the members. Many problems remain to be solved, but the hearty support of the members has made possible the start of work which will prove of great value as time goes on.

Electric Annealing Found Best by User

Experiences of a Manufacturer Who Substituted Electric Annealing for Oil-Fired Furnace Under Comparable Conditions—Contemplating Additional Electrical Applications

By C. P. YODER
Power Sales Engineer Erie County Electric Company, Erie, Pa.

AT THE PLANT of the Reed Manufacturing Company, Erie, Pa. (manufacturer of vises and plumbers' tools), is an electric furnace that has the same internal dimensions, is built on the same foundation and is used for the same class of work as the oil-fired furnace it replaced. This furnace is used for the same purpose as its predecessor—namely, to anneal round and rectangular stock for dies, pipe-cutter wheels, etc., purchased in 10-ft. and 12-ft. lengths ranging in size from 1⅛ in. diameter to 2 in. diameter for the round and 1½ in. to 2½ in. by 1 in. for the rectangular stock. These facts make it practicable to compare the two methods of heating.



OVERFIRED OIL BURNER FURNACE REPLACED BY ELECTRIC ANNEALING FURNACE

The original furnace was an overfired, oil-burner, car-type installation, equipped with two standard burners on each side. Unsatisfactory heating of the charge compelled the manufacturer to add four smaller burners on each side near the car bottom. These burners discharged the gas of combustion directly into the furnace. In an attempt to improve the efficiency of oil-fired annealing furnaces recuperators were also added to preheat the air before it entered the burners.

Experience demonstrated the necessity of providing containers for the material being annealed to prevent excessive scaling. Iron pipes of 6 in. diameter by 13 ft. long proved satisfactory for this purpose. An average heat consisted of 3,200 lb. of material, which required seven pipes for containers, having a weight of about 1,800 lb. Therefore the total weight of metal per charge was approximately 5,000 lb.

Normal production demanded the daily operation of the oil furnace. An anneal starting at 7 a.m. was usually up to temperature (1,425 deg. F.) by 8 p.m., so that the heat could be shut off. By 6 a.m. the following morning the charge was sufficiently cooled (usually black) to be replaced by another charge and the heating cycle repeated. An operator was in constant attendance, guided by an indicating pyrometer and four thermocouples located at different points within the furnace. A recording pyrometer in the superintendent's office afforded a permanent record of the heating and cooling cycle. Under the most favorable conditions there was a marked irregularity in temperature distribution in the furnace. This resulted in unsatisfactory anneals, excessive breakage of saws, general slowing up of production and often the necessity of reannealing a considerable proportion of the material.

Reasons for Change and What Conversion Entailed

To avoid the foregoing annealing difficulties the officials of the Reed Manufacturing Company investigated the possibilities of an electric furnace. Although no economies in the actual heating operation were anticipated (a slightly greater heating cost was expected), the possibilities of superior quality and uniformity of anneal with subsequent improvement in speed of production and quality of product persuaded the officials to install an electric furnace.

Due to the excellent condition of the oil-fired furnace and in the interest of economy, it was decided to rebuild the original furnace from the car level up. Aside from the electrical equipment and special refractory brick for anchoring the ribbon resistors (furnished by the General Electric Company), all furnace parts were made at the local plant and the furnace was assembled by

employees of the Reed company under the supervision of its superintendent, A. B. Bayton. The men who laid the brickwork were inexperienced in this line of work, but the excellent results obtained indicate that with careful workmen and good supervision it is unnecessary to employ expert bricklayers and skilled furnace erectors to construct an electric furnace. Inspection of the interior of the furnace after 40 heats disclosed no cracks or movement of the refractory brickwork in any way.

The electric furnace, which is rated at 205 kw., 220 volts, three-phase, was designed to handle a charge of three tons in eight hours with an energy consumption of 400 kw.-hr. per ton. The loading hearth is 13 ft. 2 in. long by 2 ft. 9 in. wide and the free height to the spring of the arch is 2 ft. 10 in.

Heat Insulation and Air Sealing

Sidewalls and the arch are approximately 16.5 in. thick. Standard firebrick with special brick for holding the heater supports constitute the lining. This is backed with standard size Sil-O-Cel brick. The outer wall, of red brick, is laid up between and flush with the buckstays. The space between the red brick and insulating brick, approximately 3 in., is filled with Sil-O-Cel powder. To give finish to the sidewalls and to provide supports to the red brick against side thrust, cast-iron plates are bolted to the vertical buckstays. Over the firebrick arch Sil-O-Cel bricks of standard size provide the insulation. These are covered with a layer of reinforced concrete about 3 in. thick.

Particular attention was given to eliminating air leakage. In addition to the usual sand seals on the sides of the car, a cast-iron flange at the back of the furnace projects into a pile of sand on the car end as the latter is pushed into place. The door frame, as well as the back of the door, is machined to give a tight fit, and special clamps, two on each side, hold the door securely against its frame. Sand seals at the top and bottom of the door eliminate the entrance of air.

Strip Heating Elements Chosen

The temperature gradient of a nickel-chromium heating unit; that is, the temperature difference between the heating unit and the furnace charge, has a definite fixed value depending on two factors—the quantity of heat dissipated per unit of surface area, usually expressed in watts per square inch, and the interference caused by supporting or spacing members and by adjacent parts of the heating unit. The deterioration of a nickel-chromium heating unit at temperatures required for the heat treatment of steel is almost negligible. At somewhat higher temperatures fairly rapid deterioration sets in, and it is therefore important to maintain the temperature difference between the heating unit and the furnace charge at the lowest possible value. This can be accomplished by installing a unit having maximum surface area so mounted as to produce minimum interference and muffling. These conditions are fulfilled by the heaters used in this furnace.

Nickel-chromium strip, 1½ in. wide by 0.07 in. thick, formed into loops 12 in. long and spaced on 3-in. centers, constitutes each heating element, of which there are two on each side wall. These loops thus form a series of parallel strips 1½ in. apart that provide a heating surface twice the area of the wall space they cover. The heating units are supported in a vertical position by refractory hooks projecting from the furnace walls. Each upper loop of an element passes over a hook, whereas the lower loops are kept in proper alignment by refractory spacers also anchored in the walls. Hooks and spacers are so shaped and located as to eliminate muffling almost entirely, and the vertical strips are sufficiently spaced to overcome interference. For 3 ft. at the front of the furnace the length of the loops is increased 5 in. to supply extra heat and thus compensate for door losses and insure a uniform temperature distribution throughout the heating chamber.

Furnace elements having smaller surface area with excessive muffling or irregularity in cross section are liable to produce unequal heating in parts of the ele-

TABLE I—RESULTS OF FIRST 37 HEATS IN ELECTRIC ANNEALING FURNACE OF REED MANUFACTURING COMPANY

Date	Heat No.	Weight of Material (Lb.)	Kw.-Hr. Used	Lb. of Material per Kw.-Hr.
12-21-25	1	7,000	.....	....
12-23-25	2	10,500	.....	....
12-26-25	3	10,000	.....	....
12-29-25	4	10,000	2,160	4.63
1-1-26	5	10,600	1,680	6.31
1-4-26	6	11,000	1,920	5.72
1-7-26	7	11,000	1,920	5.72
1-11-26	8	10,000	2,160	4.63
1-15-26	9	10,000	2,400	4.16
1-17-26	10	11,300	2,160	5.21
1-20-26	11	11,200	1,900	5.9
1-23-26	12	12,000	2,000	6.0
1-29-26	13	6,500	1,800	3.61
2-2-26	14	10,000	1,800	5.56
2-4-26	15	3,500	1,600	2.18
2-7-26	16	11,000	1,800	6.1
2-10-26	17	11,600	1,800	6.45
2-14-26	18	6,000	1,800	3.33
2-17-26	19	12,000	2,000	6.0
2-20-26	20	3,000	1,200	2.5
2-22-26	21	12,000	2,000	6.0
2-25-26	22	13,600	2,000	6.8
2-28-26	23	14,400	2,200	6.53
3-3-26	24	15,000	2,200	6.82
3-6-26	25	15,800	2,400	6.59
3-10-26	26	18,000	2,600	6.92
3-15-26	27	4,000	1,600	2.5
3-17-26	28	17,500	2,000	8.75
3-21-26	29	3,400	1,500	2.26
3-24-26	30	16,000	.....	....
3-28-26	31	17,000	.....	....
4-1-26	32	12,000	.....	....
4-3-26	33	6,500	.....	....
4-8-26	34	18,000	2,600	6.92
4-13-26	35	6,500	2,000	3.25
4-16-26	36	19,500	3,000	6.5
4-20-26	37	18,500	2,800	6.61

TABLES II AND III—OPERATING EXPERIENCE WITH OIL AND ELECTRIC ANNEALING FURNACES UNDER COMPARABLE CONDITIONS

Oil-Fired Furnace	
Average weight of material, lb.	3,200
Weight of pipe, lb.	1,800
Total weight of charge (2½ tons), lb.	5,000
Oil per heat, gal.	90 to 110
Average cost of oil, cents per gal.	6½
Cost per gallon furnace, cents	8
Operating cost per heat: Oil	$8
Labor	7
Pipes	1
	$16
Cost per pound of annealed material, cents	0.5
Gallon oil per ton, total weight of charge	40
Gallon oil per ton of annealed material	62.5
Time to bring charge up to heat, 1,425 deg. F., hours	13
Cooling time, hours	10
Heats per week	6
Production per week, lb.	19,200
Over-all efficiency of furnace, per cent	8.4

Electric Furnace	
Average weight of material, lb.	11,200
Weight of supports, lb.	1,200
Total weight of charge (6½ tons), lb.	12,400
Average kilowatt-hours per heat	2,030
Cost per kilowatt-hour, cents	1.5
Operating cost per heat: Energy	$30.45
Labor	2.00
Supports	0.50
	$32.95
Cost per pound of annealed material, cents	0.294
Average pounds of annealed material per kilowatt-hour	5.5
Average pounds per kilowatt-hour, based on total load	6.1
Average kilowatt-hour per ton of annealed material	364
Average kilowatt-hour per ton of total load	328
Time to bring charge up to heat, 1,425 deg. F., hours	18
Cooling rate, deg. F., per hour	12
Heats per week	2
Production per week, lb.	22,400
Over-all efficiency of furnace, per cent	41

ment, with a consequent deeper oxidation of the overheated portions. The deeper oxidation increases the resistance and the amount of heat dissipated in that portion of the unit and thus satisfies all the conditions for a vicious cycle.

TEMPERATURE IS AUTOMATICALLY CONTROLLED

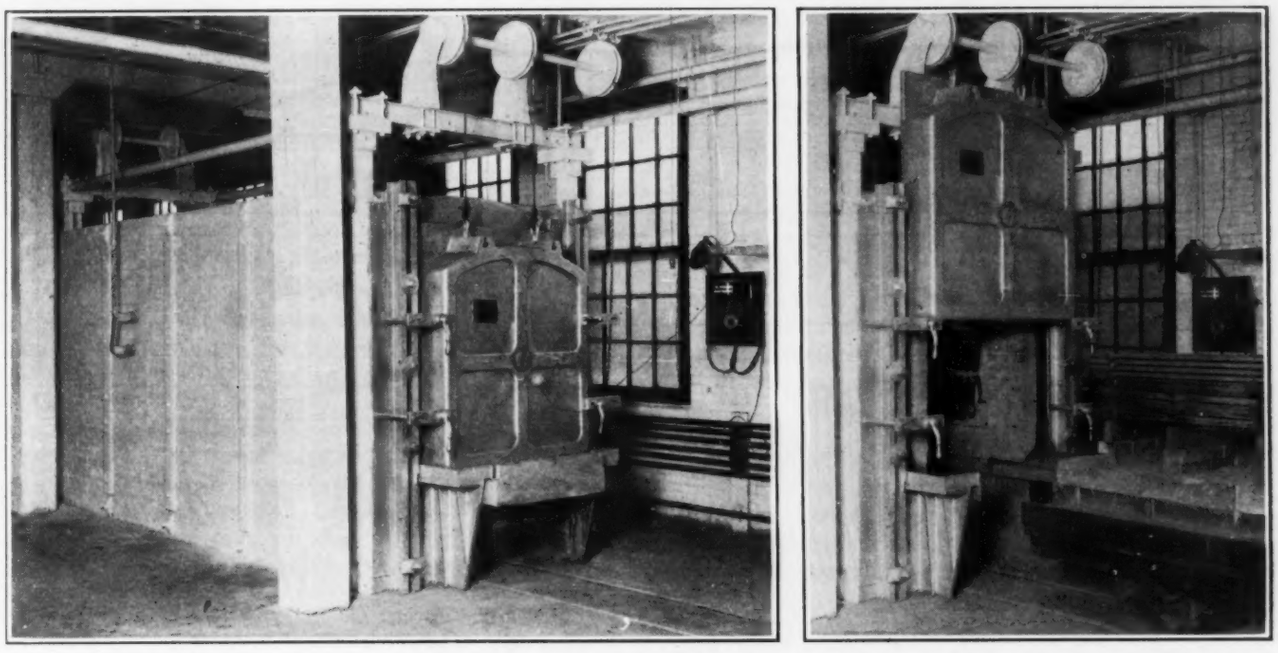
The furnace temperature is controlled by a thermocouple projecting through the roof and connected to a Brown Model 857 automatic temperature controller. A temperature-limit fuse, installed in the furnace near the thermocouple, is connected in the control circuit as an added protection against overheating. The metal of this fuse has a melting point of about 1,950 deg. F. A second thermocouple is used for determining the temperature of the charge. The material is loaded on the car in such a manner that the thermocouple can be passed through a hole in the door and into the center of the charge. An indicating pyrometer at the furnace and a recorder in the superintendent's office operate from this couple and give a record of the temperature at the coldest part of the material. By holding the heat until this thermocouple indicates the required temperature, proper penetration is assured and guesswork as to the proper soaking period is eliminated. A small temperature differential between furnace atmosphere and final temperature of charge eliminates excess heating of the surface of the material. A differential of not over 50 deg. F. is maintained in this furnace and has proved very satisfactory.

From the start of dismantling the oil furnace until the completion of the electric furnace about three weeks were consumed. Several days were then allowed to elapse before applying heat to permit the surface moisture to evaporate. A low heat was then applied and gradually increased until the normal operating temperature was reached. This process consumed about four days. In this way the greater part of the moisture was driven off, but it was not until several heats had been run that the furnace could be considered thoroughly dry.

The first regular anneal was made on the night of Dec. 21, 1925, and regular production has been maintained since that time. Table I gives a record of the first 37 heats. Cooling of the first charge demonstrated the efficiency of the furnace insulation and indicated the necessity of increasing the quantity of material per charge in order to obtain the required production. Since the normal cooling rate was found to be about 12 deg. F. per hour and since the material cannot be withdrawn above 1,000 deg. F., an excessive amount of time is consumed in the cooling cycle. However, due to the very liberal furnace rating, it is possible to heat charges of approximately ten tons, so the production schedule is easily maintained without providing special means for accelerating cooling.

The slow rate of cooling produces somewhat more oxidation than would be the case if the charge could be taken out sooner, but in spite of this the oxidation is less than that obtained in the oil-fired furnace with the material packed in tubes. A small proportion of the material, consisting of round stock worked in automatic machines, is still packed in tubes. By so doing oxidation is practically eliminated and the old difficulty of operating these machines is overcome. Speeding up of the cooling rate by means of a cooling hood or otherwise would considerably reduce the present oxidation, but this expedient has not been found necessary.

The furnace is operated on purchased power during off-peak periods only—that is, the charge is placed in the furnace so that power can be turned on at the beginning of the off-peak period (4 p.m. in summer and 5 p.m. in winter) and the heat is allowed to continue until proper annealing temperature is reached. Due to the large loads annealed, this time extends into the following day. As explained later, this overlapping of heating time into the peak period does not penalize the customer for demand owing to the load characteristics of the furnace. During the heating cycle no attendant is necessary. The automatic features maintain the proper furnace temperature and occasional



205-KW. ELECTRIC ANNEALING FURNACE OPERATING UNDER SAME CONDITIONS AS OIL-FIRED FURNACE REPLACED
Observe method of clamping, sealing and operating door, refractory hearth on car, method of supporting charge, temperature indicator and control.

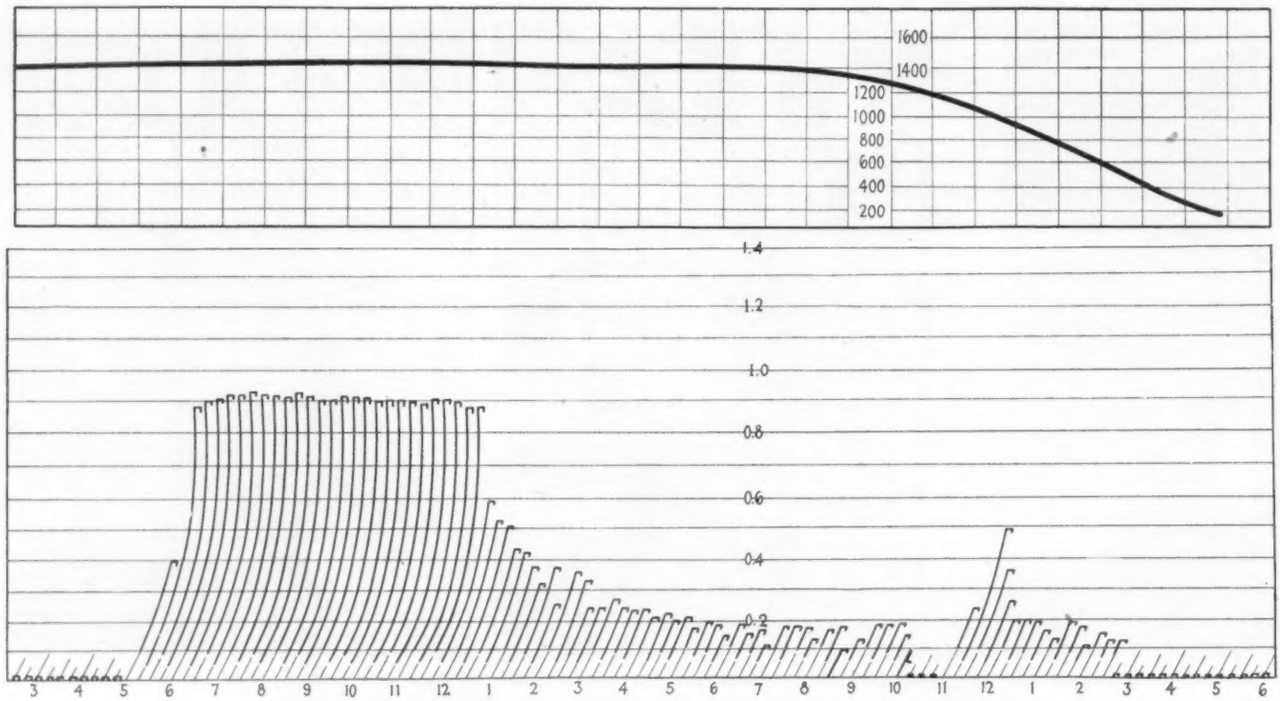
observation by the night watchman insures that the control is working properly. When the annealing temperature is reached, the power is shut off and the charge allowed to cool to 1,000 deg. F. before it is taken out of the furnace. Cast-iron supports are used to lift the material from the hearth of the car. These supports, together with spacers between the layers of material, accelerate the heating due to radiation.

HEATING AND DEMAND CURVES

Heat No. 12, Table I, represents the average charge. Experience has demonstrated that a charge of from 12,000 to 15,000 lb. gives the best general results, although there is no difficulty in heating charges up to ten tons. The temperature and power demand curves until only the power required to overcome radiation losses was being consumed. Starting with a demand of approximately 216 kw., which held for six and one-half hours, it reduced to 48 kw. at the end of twelve hours; at the end of seventeen hours it was less than 25 kw. This characteristic of an electric furnace is important when operated on purchased power and during off-peak periods, as in the present instance, since the heating cycle can be extended into peak periods with little or no demand penalty to the customer.

COMPARISONS OF OIL AND ELECTRIC FURNACE

Tables II and III give operating data for the oil-fired and electric furnaces respectively. The data of Table II are an average of the operating cost of the oil furnace



TEMPERATURE AND POWER DEMAND CHARACTERISTICS OF ANNEALING CYCLE
Refer to the discussion of these curves.

for heat No. 12 are shown. The former is a record of the thermocouple located in the center of the charge. During this run the heating cycle was unnecessarily prolonged due to the small temperature differential of 25 deg. F. between the furnace temperature and the required temperature of the material. Since this differential was not sufficient to produce the required temperature in the center of the charge, the furnace differential was increased to 50 deg. F., giving a furnace temperature of 1,475 deg. F. This increase in temperature accounts for the hump in the temperature curve near the end of the heat.

The demand curve was made by a Westinghouse type RI recording kva. and demand meter having a time interval of fifteen minutes and a chart multiplying factor of 240. This chart clearly shows the unity power factor characteristic of the load. Near the end of the record the increase in demand is due to increasing the furnace temperature. The chart indicates that the power was on continuously for six and one-half hours before the contactor began to open. From that time the intervals of energy consumption became less and less during the period it was in use, whereas Table III is an average of the 30 heats of Table I for which complete information is available. In Table III power is charged at a rate of 1.5 cents per kilowatt-hour. As a matter of fact, 1.37 cents is more nearly the correct figure. It is interesting to note that the cost of power could be as much as 2.68 cents per kilowatt-hour and still maintain the cost of operating the electric furnace on a par with the oil-fired furnace.

SUMMARY OF ADVANTAGES SECURED

Aside from the actual saving in heating cost, amounting to $4.12 per ton, the improved quality of the annealed material and general working conditions have more than justified the installation of the electric furnace. It is conservatively estimated that saw breakage has been reduced by 50 per cent, whereas the rate of production has been increased fully 10 per cent. Working conditions in the vicinity of the furnace have been materially improved. Previously the tool department on the floor above was considerably inconvenienced by oil fumes and heat radiated from the oil furnace and

from the flue that passed up through the room. These objections are now eliminated. In the past the oil furnace radiated sufficient heat to warm the annealing room satisfactorily during the winter and produce an uncomfortable condition during the summer. With electric operation it was necessary to turn steam into the heating coils last winter and the small amount of radiation is not noticeable during the hottest summer days. A comparison of the old and new installations shows the general improvement in the appearance of the annealing room.

So satisfactory has the operation of this furnace proved that plans are already under way to electrify all heating operations in the plant. An electrically heated lead pot of unusual dimensions is already on order, to be followed later by electric furnaces for hardening and an electrically heated japan oven. The management appreciates that to produce the superior product for which it is noted requires the best available equipment, and again "electric heat proves best."

Letters from Our Readers

Mr. Knight's Parting Shot on the Allocation of Costs

To the Editor of the ELECTRICAL WORLD:

Referring to W. J. Greene's letter in your issue of Nov. 13 on allocating capacity costs, I should like to point out that it is very apparent that we do not understand each other's use of ordinary terms.

For example, he states that certain of his formulas refute my claim that his methods assume that capacity costs vary uniformly with load factors, and yet he gives, in this same letter, a chart which is in accordance with his theory and which shows that the cost per kilowatt, in this instance, amounts to $64 multiplied by the customer's load factor, plus $8. In other words, starting with a minimum charge of $8, the line representing his method shows a uniform and regular increase in the capacity cost with increasing hours of use.

Again, he states that the "theory methods" do not attempt to single out those who create costs. To me this can only mean that he does not expect to allocate against customers, or classes, the costs for which they are individually responsible. Greater "accuracy," as I understand the use of the term, means apportioning costs more nearly in proportion to responsibility for same. The test of the "accuracy" of a hypothesis or of an algebraic formula is not the uniformity with which, as in this case, costs are spread over different customers or classes regardless of their responsibility for same, but depends upon the agreement of the results obtained when compared with the costs which the customers, or classes, actually impose or would impose upon the system.

Furthermore, basing costs upon the kilowatts of demand under the so-called "demand method" does not mean that customers having the average load factor necessarily cost the average amount, because they may not have the same diversity factors. The only two load factors which we can positively connect with costs incurred therefrom are the 100 per cent and the zero per cent load factors. A formula which graduates the capacity charge in proportion to load factors, even with mathematical accuracy, can have but little merit in allocating actual costs, because between these two extreme load factors differences in actual diversities make it impossible to predicate actual costs upon load factors. Hence such a method does not warrant the claim that it allocates costs "accurately," as I understand the word in this connection.

I feel, therefore, that Mr. Greene's method is not an improvement over the demand method, but, on the contrary, that it possesses distinct disadvantages, as I have previously pointed out. In view of the prolonged discussion, I am content to leave the issue to the judgment of the readers of the ELECTRICAL WORLD.

A. S. KNIGHT,
Consultant.

Boston, Mass.

What the Electric Light Bill Does Not Pay For

To the Editor of the ELECTRICAL WORLD:

On page 1024 of the ELECTRICAL WORLD for Nov. 13 there appears a picture under the caption "What Your Electric Light Bill Pays For" which contains a fundamental error that is the cause of much of the unfavorable rate regulation from which the industry suffers. This is the assumption that the customers pay for the power station, lines and substations. What the customer pays for is not the plant but the upkeep on the plant and the interest on the investment in the plant. Items 1, 3 and 5 should be changed to indicate this fact, and item 12 should include only dividends to stockholders.

When men in the industry put out erroneous statements of this kind it is no wonder that persons reading the statements of electric companies showing net earnings as high as 30 per cent on the year's business object to paying the rates that are asked. They think the new power houses which they see built every year or so are paid for from the profits of the business, so think that the profits should be reduced. The general idea of the picture is fine, but the wording should be materially changed.

ARTHUR H. FORD,
Professor of Electrical Engineering.

State University of Iowa,
Iowa City, Iowa.

Equations Used in the Calculation of Wire and Conduit Sizes

To the Editor of the ELECTRICAL WORLD:

I have noticed a few slight omissions and errors, as follows, in my article (Nov. 13 issue), "Calculation of Wire and Conduit Sizes":

1. Page 1014, second column Table I, "Impedance Drop Factors": Equation should read $K = \frac{10.8\sqrt{3X}}{\sqrt{1+\left(\frac{X}{R}\right)^2}}$; the X was omitted. Fourth column: $N = \frac{10.8 \times 2X}{\sqrt{1+\left(\frac{X}{R}\right)^2}}$; the X was omitted.

2. Page 1014, second column: Formula 10 should read: 100 ÷ 73 = circular mils × 1.37, instead of "centimeters" × 1.37.

3. Page 1015, first column, sixth line from bottom: Should read: "giving *conductor* required 228,900," instead of "giving *conduit* required 228,900." This was an error in the original typewritten copy.

MAX KUSHLAN.

Stone & Webster, Inc.,
Boston, Mass.

Central Station and Industrial Practice

Object Lessons in Accident Prevention

AN IMPORTANT feature in the safety program of the Ohio Public Service Company is the practice of conducting an exhaustive investigation of every accident to ascertain all of the contributing causes and determine wherein the method of performing a particular operation could be changed to eliminate recurrence of the accident. The plan followed is to call a meeting not only of all the members of the crew or the employees present at the time of the accident but also of all other employees of the operating departments not actually on duty.

The meeting is in charge of either the district manager or the division safety chairman who conducts the investigation. Where possible a rough model of the apparatus or equipment upon which work was being done at the time of the accident is set up or else a blackboard diagram is used. The chairman proceeds with the investigation, first calling upon the man who was injured to explain just how, in his opinion, the accident occurred. He is then questioned to bring out further details. Other members of the crew present are called upon in turn to give their version of the accident, and each is asked what recommendations he would make in the method of doing the work to prevent its happening again.

Stenographic notes of the meeting are taken, and after each man has given his evidence further suggestions are invited. At the close of the meeting a small committee, made up of the divisional safety chairman, department superintendent, foreman and a number of the crew, is appointed to study the report and submit recommendations either for additional safety equipment or for other precautions that should be taken.

It is not the purpose of these investigations primarily to fix blame or responsibility for an accident. When an accident happens, something is wrong with the materials, the tools, the man or the method, and it is to correct whatever fault exists that such meetings are conducted. Fortunately they come at infrequent intervals, but when they are held, they demand the attention of all employees and serve as excellent object lessons in safety work.

Specifications for Installation of Ranges and Water Heaters

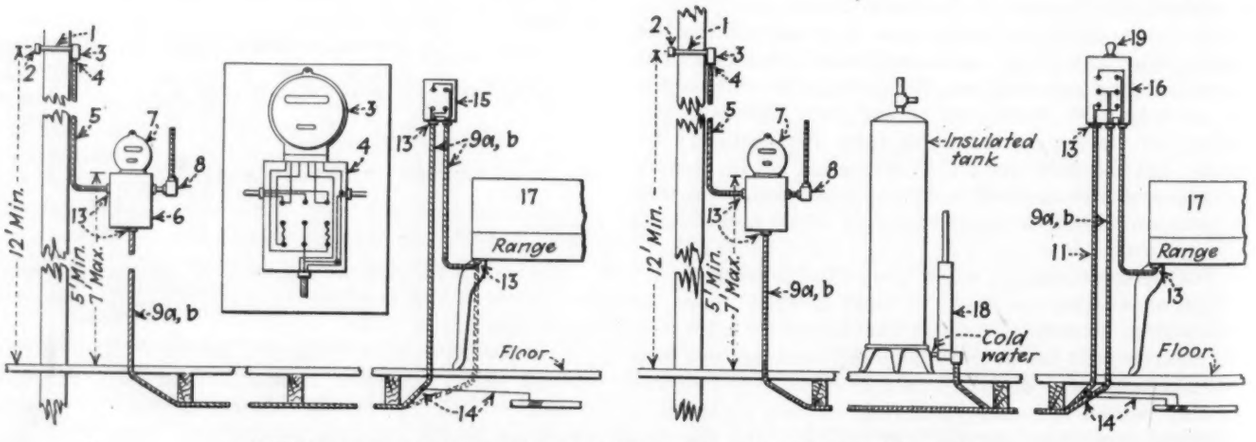
PRINCIPLES and rulings governing the installation of electric ranges and water heaters have been established by the Alabama Power Company to make the installation as simple and inexpensive as possible without conflicting with the requirements of the Fire Underwriters. These specifications, presented herewith, apply to all towns served except where local ordinances or regulations prevail.

Open wiring is permitted and is used wherever possible, because of its low cost of installation. However, the accompanying specifications cover conduit and flexsteel installations only. Attention is called to the need of attaching service wires to the house at the point where the entrance switch with meter trim will be as close to the range as possible (the majority of homes served by the company do not have basements). The meter is preferably made accessible to meter reader and tester in case occupants are away from home, and consequently must be protected from the weather.

When BX cable is used between the main entrance box and the range, the armor is used as ground conductor and bonded to nearest water main or driven ground by wire no smaller than No. 8. Lock nuts secure the cable to switch box. When flexsteel cable instead of BX cable is used a No. 8 weatherproof ground wire is connected to a lug in switch box and to system neutral and inclosed in a conduit to a point below the floor line.

RANGE AND WATER HEATER INSTALLATION SPECIFICATIONS

A. The service-entrance conduit system from the point where the overhead service wires terminate on building to main service switch box shall be as



METHOD OF INSTALLING ELECTRIC RANGE SINGLY AND WITH WATER HEATER
Key numbers refer to detailed specifications

follows (numbers refer to those on accompanying illustration):

1. 1-in. rigid conduit shall pass through wall and terminate in a condulet at both sides.

2. A 1-in. Type B condulet shall be used on outside of wall for entrance of overhead service wires. The neutral wire shall be in center hole of condulet cover.

3. A 1-in. LB condulet shall be used on inside of wall.

4. A flexsteel connector shall be used to connect BX or flexsteel conduit to the Type LB condulet.

5. The leads from the entrance to the main service switch shall be BX or flexsteel three-conductor No. 6 double-braid rubber-covered for 6-kw. ranges and larger. Where the flexible conduit connects to the condulet, the armored part of the conduit shall be stripped back far enough to provide a conductor length suitable to extend through both condulets and for making a splice with the overhead entrance wires just outside of the Type B condulet.

B. Main service switch and metering equipment shall be as follows:

6. The main service switch shall be a 60-amp., 250-volt, triple-pole, single-throw, inclosed, safety type with meter trim. The neutral shall be strapped through and connected to ground lug of switch box. Outside legs shall be fused for 60 amp.

7. The service watt-hour meter shall be a 25-amp., three-wire, 220/110-volt meter with six terminals. Potential coils shall be connected on line side of main switch and leads soldered in terminal lugs. After meter is installed, test for rotation.

8. Lighting circuit shall have an inclosed cutout box with 30-amp. porcelain fuse block. Leads from main service switch to inclosed cutout shall be BX or flexsteel of suitable size.

C. Range and water heater wiring:

9A. If range is 8 kw. or larger or at a distance from the service switch exceeding 30 ft., the leads from the main service switch to the range switch, also from the range switch to the range, shall be BX or flexsteel three-conductor No. 6 double-braid rubber-covered.

9B. If range is less than 8 kw. and at a distance from the main service switch not exceeding 30 ft., the leads from the service switch to the range switch, also from the range switch to the range, shall be BX or flexsteel three-conductor No. 8 double-braid rubber-covered.

10. For calculating the necessary wire size, the sum of the various elements of the range shall be accepted rather than the name plate rating.

11. Leads from the range switch to the water heater shall be BX or flexsteel twin conductor No. 8 single-braid rubber-covered.

12. All vertical and horizontal runs of BX or flexsteel shall be securely fastened to supporting walls or floor studding with suitable conduit straps.

13. Entrance of BX or flexsteel to switch boxes and range shall be made with flexsteel box connectors.

14. Frame of range shall be grounded to neutral conductor. The conduit shall be grounded to the water piping system with No. 8 single-braid rubber-covered wire and approved ground clamps.

15. Where range installation is made without water heater, a triple-pole, single-throw, unfused, inclosed switch shall be located close to the range and used as range switch, except where the service switch is readily accessible to the range location. In such case the leads from the service switch shall be connected direct to range.

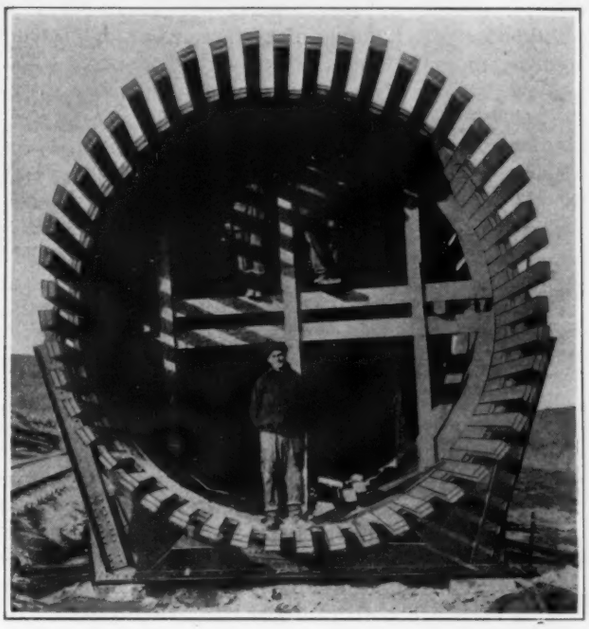
16. Where range installation is made with the water heater, a double-pole, double-throw, unfused, inclosed switch shall be used.

17. Check range wiring to see that neutral is not broken by range switch.

18. Water heaters shall be two-wire, 220 volts, and not in excess of 5 kw. Faucet-controlled automatic heaters are prohibited. The distance from the main service switch to the water heater shall not exceed 60 ft.

19. Pilot light shall be optional and shall be installed on double-pole, double-throw switch in water-heater circuit at customer's expense.

Unusual Saddles for Wood Stave Line



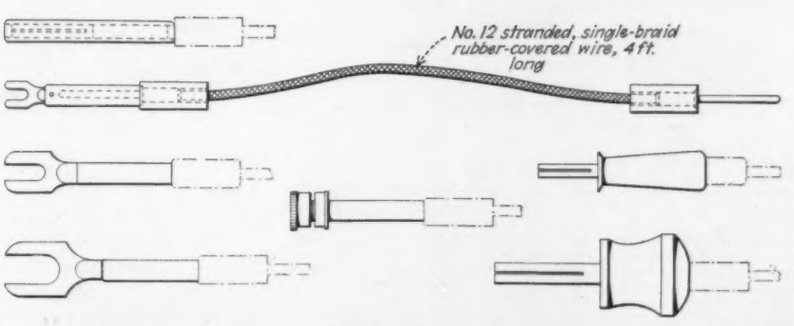
On the Wallenpaupack development in northeastern Pennsylvania steel saddles were designed for a 14-ft. wood stave pipe line. View during construction.

Universal Test Lead Terminal

BY HARRY HAMMOND
Meter Department, the Detroit Edison Company

WHEN a meter tester goes out to check meters on customers' premises he usually carries with him a set of connecting leads specially designed for the class of work he is to do. These leads are ended with terminals that fit into the standard-test connection. In the meter laboratory, however, where the kinds of tests to be performed are many and varied, it has long been the practice to carry a collection of leads. Quite often it is found necessary to make up additional terminal combinations.

To avoid the necessity for a large stock of leads, the meter department of the Detroit Edison Company has developed a standard lead that is fitted with a simple split-plug terminal at both ends. This lead is made of No. 12 wire, which is sufficiently large to carry usual instrument currents. The various special terminals, such as lugs, plugs, binding posts, Cleveland clips and others, in all sizes, are bored to permit the insertion of the lead terminal connection. An insulated sleeve provides means for connecting the standard-length leads together. The lead terminal and some of the special terminals are shown in the drawing.



STANDARD METER LEAD AND SOME OF THE DETACHABLE TERMINALS

Cost of Short Section of 110,000-Volt Tie Line

IN CONNECTION with the building of the Sherman Bridge hydroelectric development of the New England Power Company, it has been necessary to construct 2.3 miles of single-circuit, 110-kv. wooden pole line to tie the plant into the outdoor switch yard of the Davis Bridge station of the same company, both plants being on the Deerfield River in a hilly section of western New England. A recent cost analysis showed that the company had expended $23,214 on this tie and it was estimated that the completed cost of the work would be $24,840. The line has a three-phase circuit of No. 4/0 copper carried on eight and nine-disk insulators mounted on H-frame wooden pole structures set fifteen to the mile. The poles are 50 ft. in height and the conductor spacing is 12.5 ft. A ground wire is carried down each structure and there is a right-of-way 135 ft. wide. The itemized cost is given in the accompanying table.

COST OF 2.3-MILE, 110-KV. TIE LINE

Clearing	$2,240
Pole erection and setting	7,690
Power and ground wire in place	7,190
Insulators and hardware	4,387
Sub-total	$21,507
Contractor 10 per cent	2,150
Sub-total	$23,657
Engineering, 5 per cent	1,183
Estimated total cost	$24,840
Cost per mile	$10,800

Network Calculating Board

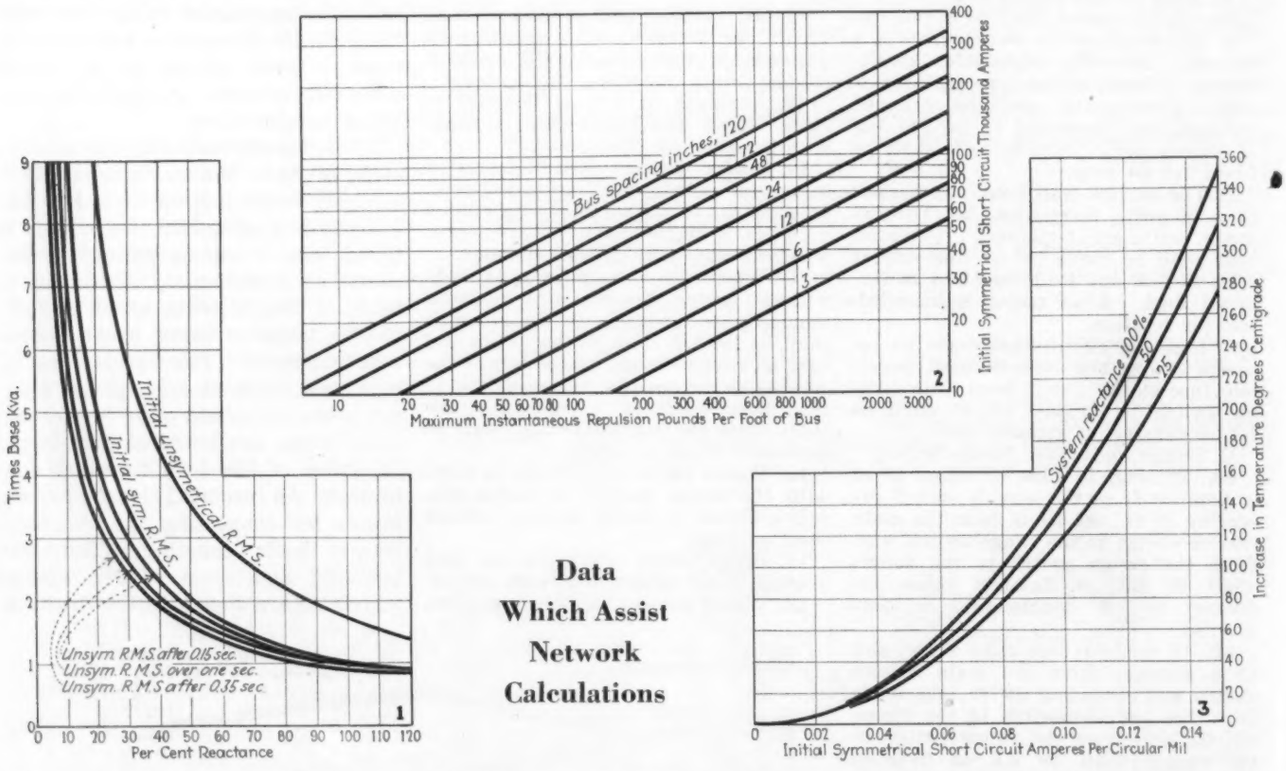
Modified Short-Circuit Calculating Table Used to Determine Distribution of Load Over Lines

BY L. M. APPLEGATE
Assistant Engineer Portland Electric Power Company, Portland, Ore.

THE system of the Portland (Ore.) Electric Power Company is represented on a calculating table, built by the General Electric Company, which was designed originally for short-circuit calculations only, but later modified by the purchaser. The principal lines and stations are represented by fixed resistors, and the proposed changes by a set of 24 variable resistor boxes. A set of bus jacks is provided for experimental set-ups. The general features of the board are shown.

In order to use the table for purposes other than short-circuit calculations, several additional features have been incorporated. The distribution of load over various lines under operating conditions requires the addition of numerous resistors of higher value than those provided for short-circuit calculations.

On this table all values are worked out on the basis of 20,000 kva.—that is, full bus voltage impressed on an impedance of 100 per cent gives an indication on the ammeter of 20,000.



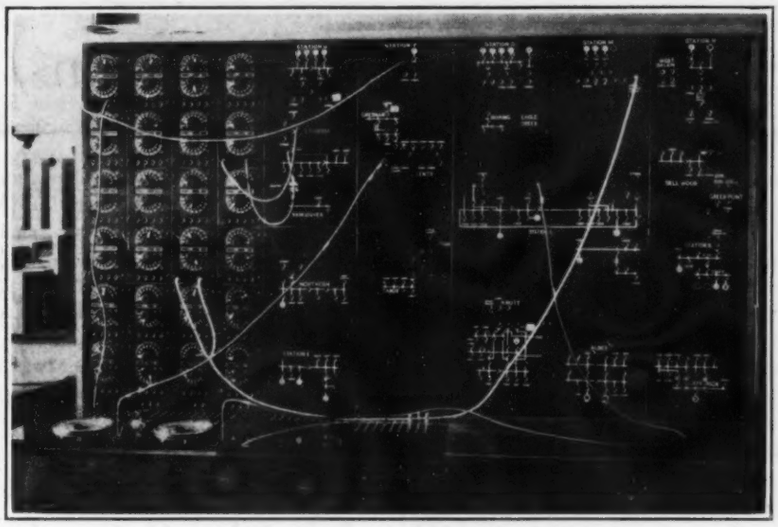
Data Which Assist Network Calculations

Fig. 1—Short-circuit calculating curves. This group of short-circuit calculating curves gives system reactance in per cent and short-circuit kilovolt-amperage in terms of the base kilovolt-amperage (in this table 20,000). The initial symmetrical R.M.S. kilovolt-amperage is the value read from the meter on the calculating table. The initial unsymmetrical R.M.S. is the maximum total current, alternating added to the direct-current component at the time of short. This value determines the maximum instantaneous magnetic stress on the bus. The unsymmetrical R.M.S. after 0.15 and 0.35 second are the values used in selecting circuit breakers to open under short circuit. The unsymmetrical R.M.S. over one second is the value given by integrating the short-circuit kilovolt-amperage over the first second of a sustained short circuit. This determines the heating effect on conductors.

Fig. 2—Forces exerted between buses during short circuit. Values of maximum instantaneous repulsion pounds per foot of bus for various bus spacings with reference to the initial symmetrical short-circuit amperes as derived from the calculating table readings. These curves are sufficiently accurate for most practical purposes and require no factor of safety, except that determined by the factor of mechanical reliability of insulation.

Fig. 3—Temperature rise in heavily insulated cables under short circuits. These three curves give the values of increase of temperature of conductors during the first second of a sustained short circuit condition.

The system reactance value to the point of short circuit usually lies between 25 and 100 per cent. The values are given in reference to the initial symmetrical short-circuit current in amperes per circular-mil.



MODIFIED SHORT-CIRCUIT CALCULATING TABLE

The cord at the top, from station P, leading to the spare variable box (top row at left) and to the jack at the bottom of the board produces the effect of adding a generator at station P. The two short cords plugged between Columbia and the adjacent spare box effect the addition of a resistance in parallel with an existing line. The long cord from station M over to the spare box (third from left and fourth from top) puts this box in series with the line from station M. The cord from station L down to the meter panel places a short circuit on station L bus. The cord from Lents to the meter panel connects the positive terminal of the voltmeter to the Lents bus. When this cord is withdrawn from the meter panel, the positive terminal of the voltmeter is connected through the jack to the positive bus. The rows of jacks at the back of the bench panels are for use as buses. The group of jacks at the right are for the extra fixed resistors for loads.

The ordinary 20,000-kva. steam-driven generator with an inherent transient reactance of 10 per cent is represented on the board by a resistor of 10 per cent (actually 1,000 ohms); a similar generator of 10,000 kva. by a resistor of 20 per cent; an ordinary transformer of 9 per cent reactance and 10,000-kva. rating by a resistor of 18 per cent; and a mile of 60-kv. transmission line by about 1 per cent. The maximum values of the variable boxes are 99 and 149 per cent.

To represent a load such as 20,000 kva., a resistor of 100 per cent is required, and for one of 2,000 kva. it takes a resistor of 1,000 per cent. For this work a set of fixed resistors having values of from 200 per cent to 1,000 per cent have been provided. The resultant system reactance with reference to a short circuit is expressed in per cent and found by using the proper values in the following equation:

Resultant system reactance per cent = 100 × total kilovolt-amperage of synchronous machines connected to system at time of short circuit ÷ initial symmetrical kilovolt-amperage at short circuit.

Regulation on the system can be determined if the voltage is read from one bus to points on the board. The table originally had the voltmeter connected permanently between the positive and negative buses. For taking regulation, the positive terminal of the voltmeter was brought to a lead, which can be plugged in at any point on the system. In relay calculations it is often desirable to know the voltage at various points on the system during a short circuit.

Each line in this table is provided with a jack at each end. To introduce additional resistance in these lines or into a generator circuit, a double lead has been designed. At one end the double cord terminates in an ordinary tip-and-sleeve plug. The other end is divided into two single leads about 2 ft. long, each terminating in a solid single plug. The variable boxes can be introduced in series at any point with this cord with the minimum of plugging.

For short circuit calculations, the curves shown which are shown on the preceding page are made use of.

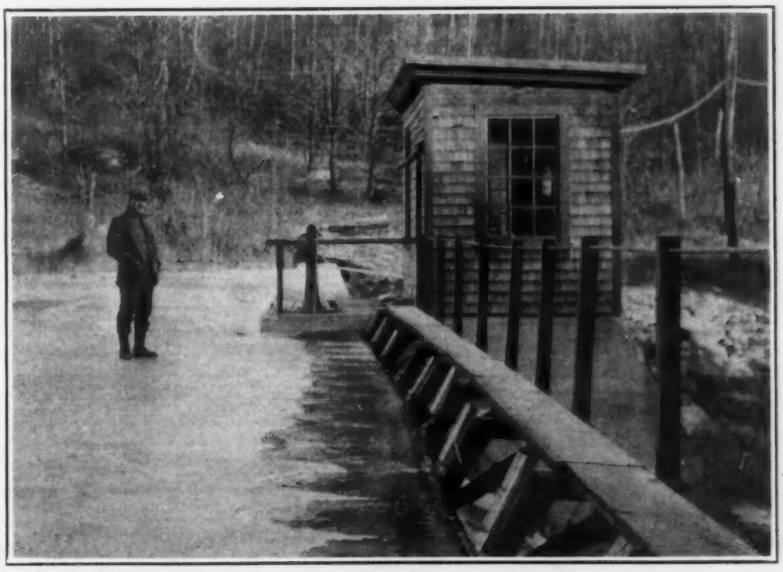
Preventing Ice on Flashboards

BY JOSEPH FRANZ
Power Engineer, Stockbridge, Mass.

AT THE Rockdale hydro-electric station of the Southern Berkshire Power & Electric Company great difficulty was experienced for several years in maintaining 4.5 ft. of flashboards on account of ice formation. As the water in the pond rose and fell with filling and drawing down, the ice would freeze to a thickness of several feet. Some success was had in keeping the flashboards clear through channel cutting, but the manual labor was expensive and the work trying in sub-zero weather.

A year ago the problem was solved by installing 90 ft. of 0.5-in. galvanized-iron pipe with ¼-in. holes bored at 3-ft. intervals about 4 ft. below the water level and 2 ft. from the edge on the upstream side of the flashboards. One end was capped and the other connected to a 2x3-in. air compressor driven by a 0.5-hp. motor. The agitation of the water by the air bubbles prevents freezing.

About 6 kw.-hr. per day suffices to operate the compressor, and the effectiveness of the scheme is shown in the accompanying illustration.



COMPRESSED AIR KEEPS FLASHBOARDS CLEAR OF ICE FORMATION AT TRIFLING COST

Commercial Activities and Public Relations

Missouri Farm Connections Increase 70 per Cent

MISSOURI farms purchasing electric service increased 70 per cent (from 2,207 to 3,766) from 1924 to Oct. 1, 1926, according to a survey made by the Missouri Committee on Public Utility Information.

The reports show that on Oct. 1 there was 1,072 miles of pole lines serving the 3,766 electrified farms of record in Missouri. This is an average of three and one-half farms to the mile of line. Although customers increased 70 per cent in two years, the length of the farm lines increased only 30 per cent, from 821 miles of line, during the same period. This might be taken to indicate that about 675 farmers who did not take service when the lines were constructed near their farms have since found it convenient or profitable to follow the example of their more forehanded neighbors and take electric service.

Information from 41 other electric companies in the state was not secured. Crediting the 41 companies that did not make reports with an average of five farm customers each —the average for the reporting companies is 31 customers—the committee estimates that approximately 4,000 Missouri farms are taking electric service from electric light and power systems as of Oct. 1, 1926.

The Missouri State Board of Agriculture has stated that there are now about 253,000 farms in the state. One farm in each 63 is now using electric service from electric distribution systems.

House-Wiring and Dead-Service Campaign Nets 1,453 New Contracts

SINCE Aug. 1 of this year the Alabama Power Company has been conducting a house-wiring and dead-service campaign that to Oct. 2 had resulted in 1,453 new contracts, 839 of which were dead-service contracts and 614 new house-wiring contracts. Wired houses that have been out of service for 30 days or longer constitute dead services. A quota of 2,000 contracts has been set, and by Dec. 31, when the campaign ends, it is expected that the quota will be far exceeded. The campaign was undertaken because it was thought that a large number of homes adjacent to existing lines could be added to the company's system with a minimum expenditure and, besides improving the operating ratio, the field for merchandise sales would be considerably broadened.

Form CUS-1114-APO—B-8871

AGREEMENT FOR ELECTRICAL WIRING

AGREEMENT between _____, hereinafter called the Purchaser, and _____ hereinafter called the Contractor:

The Contractor agrees to furnish the labor and materials for and to do the work specified below on the premises located at _____ Street, _____, Alabama; said work to be completed as soon as possible after the execution of this agreement and shall be done in a good and workmanlike manner and in accordance with the requirements of the municipal authorities and the Southeastern Underwriters Association.

The Purchaser agrees to pay the contractor the sum of _____ ($_____) Dollars within _____ days after the completion of said work.

Executed in triplicate this the _____ day of _____, 192__.

_____, Contractor. _____, Purchaser.

AGREEMENT FOR FINANCING THE ABOVE AGREEMENT

In consideration of the agreements of the above named Purchaser hereinafter made and at the request of said Purchaser, Alabama Power Company, hereinafter called the Company, hereby agrees with said Purchaser to pay the above named Contractor, upon receipt of the contractor's bill approved for payment by the Purchaser, the said sum of _____ ($_____) Dollars, less any amount agreed upon by said Contractor and the Company to be deducted by the Company; and said Purchaser agrees with the Company to reimburse the Company for said amount of $_____ in monthly installments of $_____, the first installment to be paid upon the signing of this agreement, and one installment each month thereafter until said amount shall have been paid in full; and said Purchaser also agrees to use the electric service of the Company, for which he has applied on the regular application form of the Company, of even date herewith, until such time as the conditions of this agreement are fulfilled.

It is agreed that this agreement is merely one for financing said work and that the Company has made no representation as to the skill or competency of the Contractor, who is independent of the Company, and that the Company is in no way responsible or liable for the work of said Contractor, and that the Company has not inspected such work nor approved the same.

As against the collection of any amounts that may become due hereunder the Purchaser hereby waives the right to claim any exemption allowed as to personal property under the laws of the State of Alabama.

No agent of the Company has power to modify or alter this agreement or waive any of its conditions or to bind the Company by making any promise or representation or by accepting any representation of information not contained herein. This agreement shall not be binding on the Company, unless and until approved by the auditor of the Company at _____, Alabama.

EXECUTED in triplicate this the _____ day of _____, 192__.

ALABAMA POWER COMPANY,

_____ By _____

Purchaser. Its

Approved _____ 192__

Local Auditor.

SPECIFICATIONS FOR HOUSE WIRING

ROOMS	Ceiling Outlet	Snap Switch	Flush Switch	Convenience Outlet	Wall Bracket		COST
Porch							
Hall							
Living Room							
Dining Room							
Kitchen							
Bathroom							
Bedroom—a							
b							
c							
TOTAL							

_____ Owns House _____ House Rented to

Above specifications by _____ Contractor. Approved _____ Purchaser.

CONTRACT FORM FOR HOUSE-WIRING CAMPAIGN

ALLOCATION OF TERRITORIES

The four general divisions of the company are divided into 37 districts with individual quotas varying from ten to 300. These districts in turn are divided into A, B and C classes, depending upon their quotas. Class A districts have a quota of from 100 to 300, Class B from 25 to 99 and Class C from 0 to 24. Prizes are to be awarded to the districts in each class exceeding their quota by the largest percentage. The individuals securing contracts in each prize-winning district will divide these prizes in proportion to the commissions they have earned. For the seven Class A districts first, second and third prizes are $100, $50 and $25 respectively. For the twenty Class B districts the prizes are $50, $30 and $15, and for the remaining ten Class C districts they are $15, $10 and $5.

The campaign in each district is in charge of a sales supervisor or other employee whose duty it is to

push sales and supervise the activities of all of the employees soliciting contracts. These supervisors arrange with local contractors to do the work on a fixed-price basis for different sized jobs, which price includes an allowance for 20 per cent discount that is paid the Alabama Power Company for handling and collecting the account, as the company finances the house-wiring plan over a ten-month period. However, the contractors are financing contracts in all but six of the 37 districts, thus saving the 20 per cent discount.

Form of Contract

The contract used in this campaign, which is made out in triplicate, covers the agreement with the contractor, the financing plan when this is carried with the Alabama Power Company and specifications for the wiring. The contract provides for a cash payment of $2 and 10 per cent per month until all installments are paid. In the event the purchaser elects to pay cash, he is allowed a 5 per cent discount. One copy of the contract is kept by the purchaser as a receipt for the initial payment. The two other copies are turned over to the local auditor or manager for credit approval with the names of at least two references. One of these copies is then turned over to the contractor as his authority to start work, this copy having been signed by the local auditor and manager. When work is completed, the contractor presents his bill in triplicate, together with his copy of the contract, to the power company and is paid the amount of the bill less the 20 per cent discount.

Commissions to salesmen and employees are as follows: 50 cents per outlet on each wiring contract, $1.25 each for dead services reconnected, $1.25 each for new services connected where no extension is necessary and 75 cents each for new services when extensions are required (but such extension must first be approved by division manager).

Letter and Follow-Up to Stimulate Interest

In some cases, letters were sent out to possible prospects, particularly where detailed surveys had been made. The first letter that was used follows:

You are losing the convenience, cleanliness and comfort of electric service, because your house is not wired.

We will have it wired for you and give you ten months to pay for it. This can be done for as little as $2 down and $1 or $2 per month payments.

Electricity is one of the few things that is cheaper today than it was a few years ago.

If you own your home, it will be worth more after it is wired. If you are renting, we will be glad to talk to your landlord about having it wired.

With a wired home you can have the convenience of an electric flat iron, fan and other appliances for only a few additional cents per month.

Mail us the inclosed card. We will be glad to send a representative to see you and explain our wiring plan.

If this letter brought no response, the following letter was sent out a week later:

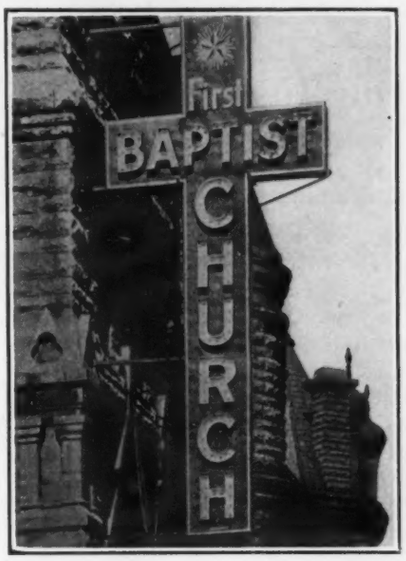
We wrote you last week about the unusual opportunity to have your house wired, with ten months to pay for it.

You do not need to deny yourself the convenience and comfort of electric service when it costs so little.

Just think of it—no more running to the store for oil, no more trimming and cleaning of smoky lamps, no more hunting for matches, just a turn of the socket and you have light. And you can also use an electric flat iron, fan and other appliances for a few cents additional per month.

Mail the inclosed card to us today. We will be glad to send a representative to see you and explain our wiring plan.

Church Attracts Attention with Electric Sign

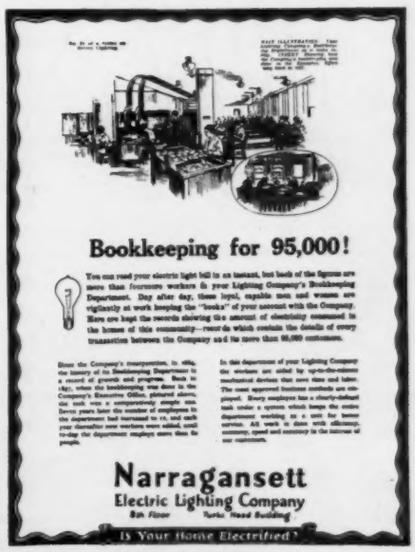


THE First Baptist Church of Des Moines, Iowa, to compete with the moving picture theaters, erected what is claimed to be the largest electric sign on any church in the country. It is 25 ft. in height, 11 ft. wide and uses 144 lamps. Each letter measures 24 in. "Churches must keep pace with the theaters and erect signs to catch the eye of the crowd. They must be made as attractive as the movies," declared the pastor of the church, the Rev. H. N. Geistweit.

Meter Reading and Billing in Public Relations

BELIEVING that the work of the meter reader and of the billing department should be given more "personality" in the popular understanding, the Narragansett Electric Lighting Company, Providence, R. I., not long ago published two advertisements that aroused considerable interest in these topics. How the meter reader qualifies as the personal representative of the company was set forth in the first insertion. The second display gave the public a "snapshot" of the activities of the bookkeeping department, which served to care for 95,000 customers at the time the advertisement was printed. An interesting feature of

"I am a Meter Reader—
My task seems a simple one—yet it carries with it a big responsibility; for it takes me into YOUR HOME, where only friends and others in whom you place implicit confidence have access.
Like a policeman, you'll always see me in full uniform during working hours. And, like him, I have a definite route over which I must travel in all kinds of weather. Sun, rain, sleet, snow, wind or blizzard holds no terrors for me and my fellow workers; for the electric meters must be read. Among my associates I'm familiarly referred to as Bill, or Jim, or Jack. To you, I'm known simply as the "Meter Reader."
Accuracy is my first thought when reading your electric meter. The dial reading must be read and reported correctly. My promotion depends upon it! And, when I call at your home, my efficiency, promptness and accuracy in reading your meter must be augmented by courtesy and gentlemanly conduct towards you and yours—always; for then I am your Lighting Company's personal representative."
Narragansett
Electric Lighting Company
8th Floor Turks Head Building
Is Your Home Electrified?



TWO MESSAGES TO PUBLIC ACQUAINTING IT WITH FUNCTIONS THAT CONTRIBUTE TO COST OF SERVICE

the advertising was a very condensed outline of the growth of the bookkeeping department from the days when the work could be done in the company's executive office to the present day, when more than 80 persons are required to keep track of the customers' use of electricity.

Estimation of Lighting Installations

An Intensity Chart Makes Possible Graphical Development of Values of Light Flux on Plane Surfaces at Varying Distances from the Source of Illumination

ALTHOUGH everyone should know that hastily given advice cannot have much value, utility customers frequently ask lighting salesmen for quick and reasonably accurate estimates on lighting installations. If too many operations requiring special consideration are not involved, the number and size of lamps to use can probably be estimated to the customer's satisfaction if not to that of a conscientious illuminating engineer.

For such estimates the chart illustrated, or similar ones, will remove the necessity for guessing and will impress the customer with the feeling that his needs are being given intelligent consideration. The particular chart shown was devised in the organization of the Sessions Engineering Company of Chicago for application to problems of industrial lighting in fairly large areas and using RLM reflectors. Other charts can be easily drawn to fit smaller areas and different types of reflectors. There are really two charts on the same sheet. One refers to light intensities and the other to lamp spacings.

Neglecting wall and ceiling reflection, the intensity chart is simply a development of the values of light flux on a plane surface at different lamp heights and taking into account reflector characteristics and lamp efficiencies. For instance, a 500-watt lamp in an RLM reflector can be said to deliver a definite amount of light over a certain area at a certain mounting height. At greater or less heights the light intensity over the area will decrease or increase. The broken vertical lines on the chart represent increasing intensities for different lamps as the mounting heights are reduced. Connecting the 5 and 10-foot-candle points respectively by two smooth curves affords references for intensity.

The number of lamps (in given reflectors) required for the even illumination of a certain area depends upon the length and width of the area and the mounting height of the lamps. For a given height the number of rows of lamps is determined by the width of the area, and the number of lamps in a row depends on the length or the ratio of length to width. The spacing chart is then an expression of the spacings, numbers, and numbers of rows of lamps that will result in uniform illumination with the type of reflector selected for specific characteristics.

It should perhaps be repeated that this particular chart applies only to RLM reflectors and it is understood that the use of this chart is not to take the place of illumination engineering judgment, but merely to supplement it.

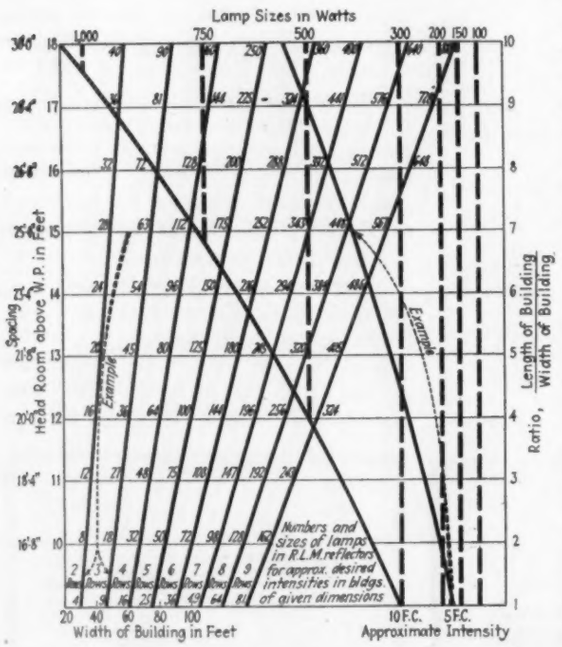
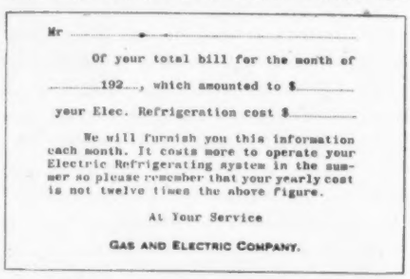


CHART FOR ESTIMATING LIGHTING INSTALLATIONS

As an example of the use of the chart, consider a building 60 ft. wide and 90 ft. long with 15 ft. headroom above the working plane on which 5 foot-candles is desired. Following the 5-foot-candle curve to its intersection with the 15-ft. headroom line, it is seen that a 500-watt lamp will supply nearer 5 foot-candles than will a 300-watt lamp. As a matter of fact, the 500-watt lamp will furnish about 6 foot-candles, which is satisfactory. To find the number of lamps required the ordinate of 60-ft. width is followed to its intersection with the 15-ft. height abscissa, which is found to lie in the area between the two and three row lines and to permit a maximum of 25-ft. spacing. If the walls of the room are light in color, it might be permissible to use only two rows of lights; if they are very dark, three should be used. The ratio between the length and width of the building is 1½ to 1. The intersection of the 1½ ratio abscissa with the two or three row line will show the number of lamps necessary for either case. If two rows are used, six lamps will be needed; three rows will require twelve or fifteen. Since the original requirement of 5 foot-candles was exceeded by the use of the 500-watt lamp, it probably would be satisfactory to use the smaller number of lamps.

Showing Customers Monthly Cost of Refrigeration

AMONG the objections raised by customers to the purchase of an electric refrigerator is doubt as to the amount of energy that will be required to operate it. In most instances power companies have found that the refrigerators are purchased and installed at a time when lighting bills are lowest and seldom does the customer complain of or even realize the additional energy consumption by his refrigerator.


Mr _____

Of your total bill for the month of _____ 192___, which amounted to $_____ your Elec. Refrigeration cost $_____

We will furnish you this information each month. It costs more to operate your Electric Refrigerating system in the summer so please remember that your yearly cost is not twelve times the above figure.

At Your Service

GAS AND ELECTRIC COMPANY.

SLIP SHOWS CUSTOMER COST OF OPERATING ELECTRIC REFRIGERATOR

One company, however, has taken steps to inform its customers exactly what their refrigerators are costing them each month and incidentally collect some valuable data on the load characteristics of these devices. A sub-meter is set on all refrigerator installations and readings are taken at the time of the regular meter reading. The accompanying slip, showing the total and the amount used for refrigeration, is included with the regular bill. This has been found very effective in convincing customers of the low cost of electric refrigeration and the salesmen of the utility concerned are finding the figures of these energy consumptions and operating costs month by month to be potent additions to their sales arguments for the adoption of electric refrigeration.

Digest of Electrical Literature

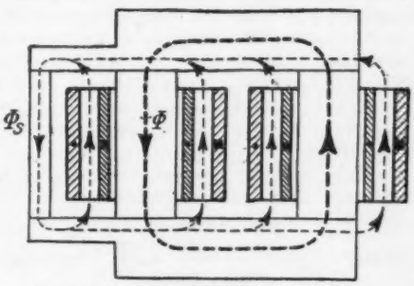
Hydro-Electric Development and Steam Equipment

Electric Generators in Steam-Heating Plants.—R. POHL.—In an effort to raise the efficiency of steam-heating plants, which is rarely more than 15 to 25 per cent, the author suggests that all industrial plants should provide high-pressure steam boilers, use a turbine generator as a reducing valve and heat with the exhaust steam. The generator would have to operate in parallel with the local electric supply system. While this idea is not new, very little progress has so far been made, chiefly owing to objections raised by misinformed central stations, which fear interference from the parallel operation. Objections of this nature are not warranted, provided that the output of the industrial generator is very small compared with the capacity of the central station. In larger cities such a ratio will today be the rule. On the other hand, the central station itself is greatly benefited by such a tie-in, because the severity of its peak load is greatly lessened. The author shows by actual examples that such "reducer" turbo sets are not only very efficient (up to 70 per cent), but that they produce electrical energy at a fraction of the cost of central-station service. In addition, by providing oversized generators magnetizing energy can be furnished to improve the power factor of the manufacturing plant load. Caloric and cost investigations made for a heating plant of an industrial concern employing four thousand men show that the investment cost of an 850-kw. "reducer" turbo set can be expected to be paid off at the end of the first winter season. Since a clutch is provided between the turbine and the generator, the latter may be run as a synchronous condenser during the summer months. It is of interest that the late Dr. Steinmetz advanced similar ideas in a talk before the A.I.E.E. in 1918.—*Elektrotechnische Zeitschrift*, Oct. 14, 1926.

Transmission, Substations and Distribution

Automatic Rectifier Plants. — W. WALTY.—During the last two years one Swiss concern has equipped 26 fully automatic substations, in which mercury-arc rectifiers transform alternating current into direct current. It was established that the performance of these stations is very satisfactory and that they are less liable to cause service interruptions than manually operated plants. The required automatic apparatus has been brought to such perfection that all problems can be safely and positively solved. The fact that the station can be installed in the center of the power demand avoids long feeders and does away with special voltage-drop regulation. The article goes into great detail in describing the type and the function of the various relays which are needed for fully automatic operation.—*Brown, Boveri Mitteilungen*, October, 1926.

Three-Winding Transformer. — A. MEYERHAUS.—A large Swiss company has at present going through its shops four transformers of very unusual size and design. One of the hydro-electric power houses which supply the Federal Railways required transformers to change the generator voltage of 15,000 to two transmission voltages of 66 kv. and 132 kv. and to permit also the tie-in of the latter two voltages without feeding the 15-kv. winding. The generator and the power lines are single-phase, 16⅔ cycles. The designer provided single-phase, two-legged core-type transformers, with an 11,000-kva., 15,000-volt winding on each leg, a 66-kv. concentric winding on one leg and a 132-kv. concentric winding on the other leg. With this arrangement of coil stacks the transformer operates like two single-phase transformers, each leg representing one 11,000-kva.



CROSS-SECTIONAL VIEW OF UNUSUAL TRANSFORMER CORE DESIGN

unit. Under certain load conditions the magnetic flux resulting from these three windings must find a return path outside of the iron core, which would have caused a prohibitive heating of the steel-tank wall. A small third auxiliary leg was therefore joined to the core for the sole purpose of providing a safe flux path. Compared with a 50-cycle, three-phase transformer, this machine represents an equivalent of 100,000 kva. capacity. — *Elektrotechnische Zeitschrift*, Oct. 7, 1926.

Notes on Transformer Polarity and Connections. — JOHN AUCHINCLOSS. — This article is a very complete treatise on polarity determination of transformer connections. Detailed drawings of connections accompany the discussion, which covers in succession the origin of transformer polarity, checking polarity by alternating and by direct current, current transformers, determination by wattmeter methods and transformer group forms. A second installment of this article will appear in a later number of the journal.—*General Electric Review*, November, 1926.

Generation, Control, Switching and Protection

High Power Direct-Current Tests.—H. M. WILCOX.—The increasing tendency toward the use of automatic control circuits in railway substations has drawn further attention to the question of general reliability of the control features of certain apparatus. Investigations along this line have been carried on for the most part outside of the class of tests usually known as power tests, the performance of such equipment over a period of time under service conditions being generally regarded as of more significance in judging their adequacy than performance under test conditions. According to the author, data concerning the behavior of switching equipment when operating along the upper limits of the range of possible short-circuit current values that may be encountered in high-power substations is not so abundant. Such tests are generally considered beyond the range of practical test-floor operations, since, even if the machines themselves are available, there is usually a lack of necessary amount of primary power to keep them up to speed when subjected to a heavy short circuit, and the resultant slowing down of the machines not only constitutes a hazard but throws considerable doubt on the results of the test itself. The results of the test described in the paper are offered by the author as throwing additional light on the requirements for substation switching apparatus under conditions of extremely heavy short circuits. It is believed that the results of these tests as described in this paper may be taken as assurance that adequate and reliable switching equipment can be provided for direct-current substation service and will protect the apparatus in that station from damage due to any incoming short circuits within the limits of present-day concentrations of power and within the limits of such normal increases in power concentration as may be foreseen for several years to come.—*Electric Journal*, October, 1926.

Units, Measurements and Instruments

Arch Dam Investigation.—This bulletin, issued by the Engineering Foundation, is a progress report on the Stevenson Creek test dam, constructed near Fresno, Cal. Various measurements and observations were begun with the first steps of construction of this test dam. While the concrete was being deposited hundreds of instruments, parts of instruments and metal reference marks were very carefully set in place to be used in measuring strains, deflections and temperatures. A routine of tests consisted of: (a) Taking measurements of the dam under conditions of no load; (b) loading the dam by admitting water to the pond behind it up to a definite predetermined elevation and holding the water at that elevation while a complete series of measurements were being made; (c) withdrawing the water from behind the dam until a subsequent test; (d) repeating these tests so as to secure complete check measurements. Under such routine duplicate tests were conducted with the water at 20 ft., 30 ft., 40 ft. and 50 ft. elevation. The dam has been built to a height of 60 ft., and the final test at this elevation will be held in the near future.—*Bulletin No. 4, Engineering Foundation*, Oct. 15, 1926.

Frequency of Lightning.—S. RUMP. —Numerous investigators have attempted to calculate or to measure the characteristics of lightning discharges,

with greatly varying results. Of greatest value were measurements made recently by Norinden and oscillographic methods employed by Watt. In the paper under notice the author undertakes to calculate the speed with which a thunder cloud has to discharge to cause local overvoltages on a nearby transmission line, in spite of the rapid conduction of this transient overvoltage along the extent of the line. To provide a basis for his calculations, the author assumes a maximum electrostatic field variation of 100 kv. effective per meter height. For extreme cases this value may be increased to 280 kv. per meter. To arrive at actual values, transmission lines of 110, 50 and 8 kv. are assumed, with and without an overhead lightning cable. With formulas developed for the purpose, the speed of discharge is calculated for each case and the results are tabulated. Based upon these conclusions, the effectiveness of three types of lightning arresters is investigated—that is, of the spark-gap resistance type, the electrolytic type and the induction type. The highly mathematical article covers twenty pages with thirteen illustrations.—*Bulletin de l'Association Suisse des Electriciens*, September, 1926.

Illumination

Proposed Basis of Rating for Measuring the Quality of Street-Lighting Service.—ARTHUR J. SWEET.—The problem of measuring the quality of street-lighting service is a complex one, being made up of various elements which must be independently measured and the results of such measurements combined with due regard to the relations of each to the complete quality value. The principles governing the derivation of a net value from the values from element qualities are first studied in this paper. A division of the subject is then made as between utilitarian and esthetic qualities of street lighting. Illumination intensity measurements and brightness measurements, each taken at significant points of measurement and each reduced to such value as would be equivalent for discernment were glare entirely absent, are then combined, the basis of combination varying with the value of the illumination and intensity measurements. Service quality is separately measured for roadway and sidewalk and the independent values are combined into a single value. With respect to esthetic qualities, the conclusion is reached that it is practicable to derive certain principles of a general nature which will be of value in arriving at decisions as to relative merits; but that any quantitative evaluation of esthetic merit is impossible at this time.—*Transactions of the Illuminating Engineering Society*, November, 1926.

Motors and Control

Control Equipment for Movable Highway Bridges.—H. H. VERNON.—The most common type of movable bridge used, according to the author, is the bascule or lift bridge, and this article deals with control for the leaf, lock, gate and pump motors, solenoid brakes, signal lights and trolley circuits for electrically operated bridges of this type. It is essential that the control be simple, reliable, easy to operate, rugged and compact, that it provide maximum of protection and consist of standard parts that are in regular production. The author presents a detailed discussion of each of these requirements.—*General Electric Review*, November, 1926.

Electrification of Oil Fields.—W. KOBS.—Following a brief historical review of the application of electric power to oil field operation and an enumeration of the principal advantages of the electric drive over others, the author proceeds to cover in great detail a variety of the applications of electric motors to oil-field operation. Different types of borings and boring methods are described at length. The size of boring motors, their control, electric drive for cooling pumps and equipment for auxiliary operations are mentioned likewise. The subject of controllers for the electric machinery used is treated next. The applications described in the paper cover the majority of those for which the electric drive is used in oil fields. The remainder, according to the author, give rise to no special requirements.—*A.E.G. Progress*, September-October, 1926.

Construction of Squirrel-Cage Motor Windings.—B. A. BRIGGS.—This article describes in some detail various types of windings and explains the effects of the type of slots and length of air gap on the operation of the machine.—*Power*, Nov. 23, 1926.

Heat Applications and Material Handling

Multiplex Windings for Direct-Current Machines.—CARL C. NELSON.—With the increase in capacity of direct-current machines the question of their successful operation has become more and more important. It is thought that multiplex windings offer creditable advantages if they are designed so that cross connections can be suitably applied and the circuit thereby kept balanced, a feature which, according to the author of the paper, did not have thorough consideration when multiplex windings were first tried. This paper describes machines in which the proper design may be secured when standard construction is used. Both the lap and wave types of windings are considered. The principles are applied to duplex windings in this article, but, if so desired, they may, according to the author, be applied also to triplex and other multiplex windings. A brief description of "frog-leg windings," a recently developed type of multiplex winding, is also given.—*Journal of A.I.E.E.*, November, 1926.

Refractories for Induction Furnaces.—M. UNGER.—The requisites for a commercial furnace lining of induction furnaces are detailed and discussed. Of the various materials studied, magnesium oxide proved to be the one refractory more nearly fulfilling the conditions than any other, according to the author of this paper. Proper grading of the magnesium oxide is very important. Pitch was selected as the best bonding material. For continuous operation on steel and a slag analyzing 20 to 25 per cent silica, the magnesium oxide lining is said to last through 400 heats, where consideration is confined to the horizontal-ring, iron-core type of induction furnaces with operating temperatures from 1,500 deg. to 1,800 deg. C.—*Paper presented before American Electrochemical Society*, Oct. 11, 1926.

Electrophysics, Electrochemistry and Batteries

Cadmium: Its Electrodeposition for Rust-Proofing Purposes.—C. M. HOFF. The physical and chemical properties of cadmium are described in this paper. A comparison of these with similar properties of zinc indicates that cadmium should be a better rust-protecting plate than zinc because it is less active chemically, but at the same time protects iron electrochemically, forms a protective oxide film, is not amphoteric in character and, although softer than zinc, is more ductile. A solution has been developed which deposits cadmium in a dense, ductile, adherent, bright form over a wide range of current densities, is in equilibrium with the anodes, is self-sustaining, has low resistance, high throwing power and will accommodate high current densities. Thin deposits of cadmium effect comparatively great rust resistance. The time of deposition is short, which enables increased production to be obtained with plating equipment, with lowering costs. The properties of cadmium and its method of electrodeposition are such that it has a definite place in the field of rustproofing, for which it is better suited than zinc.—*Paper presented before the Electrochemical Society*, October, 1926.

Telegraphy, Telephony, Radio and Signals

Radio Field-Strength Measuring System.—H. T. FRIIS and E. BRUCE.—This paper deals with a new system of measurement which has been used successfully at a frequency as high as 40 megacycles. While this frequency has been the extent of the authors' endeavor, it is their belief that the fundamental principles can be employed at still higher frequencies when the occasion demands. The apparatus is a double-detector receiving set which is equipped with a calibrated intermediate frequency attenuator and a local signal comparison oscillator. The local signal is measured by means of the intermediate frequency detector, which is calibrated as a tube voltmeter.—*Bulletin Reprint B-209, Bell Telephone Laboratories*, September, 1926.

Transmission Features of Transcontinental Telephony.—H. H. NANCE and O. B. JACOBS.—In this paper the various steps in the establishment of the existing network of transcontinental-type circuit and transmission design considerations are reviewed by the authors. The discussion covers the communication channels obtained from transcontinental-type facilities and the bands of frequencies employed and includes carrier-current system, telephone repeaters and signaling systems. Mention is made of special uses of transcontinental telephone circuits, such as the transmission of program material for broadcasting.—*Journal of A.I.E.E.*, November, 1926.

News of the Industry

Vincent Line Built South

Pasadena-Bakersfield 95-Mile Section Completed—California Edison's Bungalow Substations

MARKING the completion of the construction work on the southern half of the third 220,000-volt transmission line of the Southern California Edison Company, E. R. Davis, manager of construction for the company, on Sunday, Nov. 21, closed the switch at Magunden substation, 6 miles east of Bakersfield, energizing the new line and bringing it into active use as a part of the great network of electric lines through which the company serves southern and central California. This line, known as the Vincent line, will be built through to connect with the series of great hydro-electric plants situated on the Big Creek and San Joaquin Rivers in the northeastern part of Fresno County.

This 95 miles of line has required almost one full year to construct and has cost approximately $25,000 per mile, which includes the cost of building roads and constructing telephone lines and the purchase of the necessary rights-of-way. Beginning in the foothills just north of Pasadena, a construction force of more than 600 men has steadily worked north toward its first objective, Magunden substation, erecting towers and stringing cable as it progressed. In addition to the line construction work, it was necessary for the company to spend approximately $400,000 at Magunden substation to make it ready to handle the additional load which the new line would put upon it.

An interesting fact developed during the summer. Early in June it became apparent to the Edison company that the amount of 60-cycle energy available from the San Joaquin Valley territory from the two original 220,000-volt lines would not be adequate to supply the San Joaquin Valley with its constantly growing demand. As a consequence the company made a change in its plans and, concentrating its full force of 600 men on the short stretch of line extending north of Magunden, actually completed 24 miles of this line in 24 days, which is thought to be a world's record for this type of construction. The feat made it possible to pour into the San Joaquin Valley the entire output of the great plant on the Kern River known as Kern River No. 3.

In the northern end of the San Joaquin Valley near Farmersville, at the coming Rector substation, which the company is about to build, a frequency changer with a capacity of 30,000 kw., is to be installed. This frequency changer is three times as large as any of those now in existence on Edison lines and will serve to insure a sufficient supply of 60-cycle energy for the San Joaquin Valley for some time to come. The Vincent line, on which an exceedingly large-sized cable has been used as a conductor, will have a capacity of slightly more than 200,000 hp., which is more than the combined capacity of the two original 220,000-volt lines now in operation between the Big Creek-San Joaquin project and southern California. Work on the northern half of the Vincent line will be pursued diligently, and it will be ready for operation early in 1928, coincident with the completion of the fifth great hydro-electric plant on the Big Creek-San Joaquin project.

Construction work on a new bungalow type of substation building in the Manhattan Beach section of the Redondo Beach territory began last week. This substation is expected to cost approximately $48,000. In the construction of substations in residential territory the Edison company has adopted the policy of building what is known as a bungalow-type structure, which is in effect a typical California bungalow with the electrical equipment concealed. All lines leading in or away from stations of this type are placed underground and all outdoor equipment is placed in the back of the building. The new installation will add approximately 2,000 hp. of energy to the Manhattan Beach territory.

Central California Project

American River Water & Power Company Will Begin Work on Two 25,000-Hp. Plants Next Year

COMING construction of two hydro-electric plants on the Middle Fork of the American River in east central California, with a total capacity of 50,000 hp. and to cost $8,250,000, has been announced by the American River Water & Power Company of San Francisco. Preliminary engineering has been completed and applications for water rights have been filed with the State of California and the Federal Power Commission. The development, in addition to generating power, will furnish water for irrigation. It is planned to wholesale the power to an existing utility company.

Present plans contemplate a 200-ft. dam, a 7-mile tunnel which will divert water from the North Fork and an 11-mile flume which will drop the water 2,000 ft. to power house No. 1. This plant will contain two 12,500-hp. impulse wheels driving a 20,000-kw. generator. From below this plant water will be carried through a 9-mile flume and á 3-mile tunnel to power house No. 2, which is to contain similar equipment operating under a head of 1,750 ft.

Final surveys will be completed in the spring and construction is expected to be under way by the fall of 1927. The output of both plants has already been disposed of, and capital will be furnished by Eastern financial interests. The president of the company is C. W. King.

Buffalo's New Unit Goes In

A 60,000-Kw. Turbo-Generator Added to Steam Station Rechristened for Company's Late President

TURNING a throttle wheel at the steam power house of the Buffalo General Electric Company hitherto known as the River station on Monday afternoon, Nov. 29, William R. Huntley, new president of the company, put into service a 60,000-kw. (66,667-kva.) turbo-generator. The huge machine—equal in size to any single unit yet installed—turned over smoothly and took up the load without any hitch. With it the station will have a total rating of 155,000 kw.

This is the station which was conceived in 1915 and carried through by the late Charles R. Huntley, long president of the company, against conservative opposition, his foresight being abundantly vindicated by the conditions soon brought about by the war. In tribute to Mr. Huntley's achievements the station will be renamed for him and known as the "Charles R. Huntley station."

Work on the addition to the station was started early last spring. Besides the turbo-generator, the new equipment includes four boilers built to burn powdered fuel and a transformer which also ranks among the largest yet built. The foundations of the generating unit rest on ten reinforced-concrete caissons driven down 40 ft. to bedrock. The addition was designed entirely by the engineering department of the Buffalo General Electric Company and was built by the Derdenger Construction Company of Buffalo,

Officials of the Buffalo, Niagara & Eastern Power Corporation and of several of the companies which are associated with it were present when the new machine was put into service. The Buffalo General Electric Company was represented by President Huntley, Vice-president Paulding F. Sellers, Chief Engineer Harvey M. Cushing and other officials. President Fred D. Corey of the Niagara, Lockport & Ontario Power Company; Benjamin F. Lee, Norman R. Gibson, Jacob F. Schoellkopf, Sr., Alfred H. Schoellkopf, Colonel William Kelly and many other officers of the Buffalo-Niagara group of companies were also present.

Plea for Transmission Over Lower Delaware River

The Electric Securities Company of New Jersey has asked the Chief of Engineers of the United States Army to reopen the case in which the company seeks permission to carry a transmission line over the Delaware River between Pigeon Point, Del., and Deepwater Point, N. J., places not far from Philadelphia. The application was denied previously, largely on the ground that it would constitute an un-

justifiable hazard in the operation of air craft over the river. The company contends that the transmission line will not render unsafe "the normal and rational operation of air craft and will not interfere at all with navigation." It is to be carried on two 335-ft. towers 3,300 ft. apart, and at the lowest point of sag the line will be 200 ft. above the river at high tide.

It is pointed out by the company that there is great public need for the transfer of large blocks of power in either direction across the Delaware. This is held to be essential to meet the power needs of southern New Jersey. The diversified nature of the power requirements on each side of the Delaware River make for an ideal application of an interchange policy, the company says. The seashore resorts have a heavy lighting load, but in the daytime can furnish large blocks of power to the industrial region across the Delaware. After the industrial load goes off, generating capacity is available for the lighting peak. Transmission under water is held to be impracticable and unreliable. In addition, the cable frequently is damaged by ships' anchors.

Why Canada Objects

Her Reason for Opposition to Single-Stage Development on the St. Lawrence—Official Optimism Prevails

OTTAWA advices are to the effect that it is likely that the Canadian government will deal with the report of the Joint Engineering Board on St. Lawrence development, noted last week (page 1133), by submitting it to the National Advisory Commission on St. Lawrence Waterways for advisement. However, action of this nature will probably not be taken for at least two months, pending the completion of the seven appendices upon which the long report of the joint board is based.

The principal objection taken in Canada to the single-stage power development proposals of the American engineers is that while this scheme would give a little more power at slightly less cost than the double-stage plan, it would involve subjecting the dwellers in 23 miles of Canadian towns and country to life behind a 17-ft. dike with the waters of the St. Lawrence six to seven feet above the street levels. People living in the vicinity, who are experienced in the power of the St. Lawrence ice shoves, would consider themselves under perpetual menace of disaster.

As far as Ontario is concerned, the plans of the Hydro-Electric Power Commission are emphatic in their insistence upon the two-stage development. These plans have been on file with the Dominion government for a couple of years now. Ratification has been withheld by that government until the report of the joint commission should be released. The attitude of the Ontario government was revealed in the following statement issued by Premier Ferguson, following the publication of the report of the Joint Engineering Board:

"The various governments concerned must ultimately decide upon the policy to be pursued in developing power on the St. Lawrence River. The report just submitted deals only with territorial features and is in the nature of a recommendation to the International Joint Commission, which will in due course consider the engineering problems dealt with. I am going to arrange a conference with the Hydro-Electric Power Commission with a view to renewing negotiations for an early solution. Eastern Ontario especially requires immediate power supplies, and I think we can successfully obtain general satisfaction for all the authorities interested in hydro-electric plans."

In a long statement reviewing the report of the Joint Engineering Board, which he regards as a step forward, Chairman C. A. Magrath of the Ontario Hydro-Electric Power Commission holds out hope that the United States authorities may be induced to accept the Canadian plan for a two-stage development. He bases this view in part on the conferences held some months ago between the Ontario and New York commissions respecting the development of the St. Lawrence, concerning which he says:

"The general advantages and disadvantages of single and two-stage developments were discussed. The New York State authorities had previously expressed themselves as favorable to a single-stage development, but they definitely expressed their willingness to give further consideration to the whole subject of a two-stage development such as had been recommended for the Province of Ontario. In other words, instead of being more or less committed to a single-stage development, the New York State authorities definitely and affirmatively left the question open for the particular method of development which might ultimately be decided upon as most suitable for all interests concerned."

St. Lawrence Commission to Take up Engineers' Report

A meeting to consider the report of the international Joint Engineering Board on St. Lawrence River development and the report made by the board of army engineers on the proposed Lakes to Hudson waterway will be held in Washington on Friday, Dec. 10, by the American section of the St. Lawrence River Commission, which will present its conclusions to the President. It is understood in Washington that the Canadian section of the international commission will meet in Ottawa at about the same time, but no arrangement has been made for a joint session of the commission. Secretary Hoover is chairman of the United States commission and the other members are William C. Breed, New York; James P. Goodrich, Winchester, Ind.; James E. Davidson, Bay City, Mich.; Charles L. Allen, Worcester, Mass.; James R. Howard, Chicago; James P. Noonan, Stephen B. Davis and Charles P. Craig, all of Washington, D. C.

New River Not to Be Diverted

Major Trippe Announces that Federal Power Commission Disapproves Application of Eastern States Development Company—Other Projects Before Commission

ANNOUNCEMENT has been made at Huntington, W. Va., by Major Henry M. Trippe, United States engineer for that district, that the Federal Power Commission will not grant the petition of the Eastern States Development Company and the Central Power Company for a permit to dam New River near its head and divert its waters through Virginia and into North Carolina by tunneling an intervening mountain, thus obtaining a drop of 1,500 ft. At two hearings, held by Major Trippe in Roanoke, Va., and Bluefield, W. Va., West Virginia protested against the plan. It was the first of the kind proposed, and it is thought probable that the decision will form a precedent where there is a question of transferring water-power sources from one state to another. The plan had no connection with that now taken over by the Appalachian Power Company for a dam in the New River near Radford, Va. The latter project has also evoked strong opposition, as already recorded in these columns, and the West Virginia Public Service Commission has just filed a protest against it for fear of injury to navigation and future water power.

Further evidence of the fact that American newspapers are beginning to look to Alaska for their supplies of print paper is shown by the application to the Federal Power Commission by George T. Cameron, publisher of the San Francisco *Chronicle*, for a preliminary permit covering a power project on Crater and Long Lakes in Alaska. The power is to be used for the operation of a newsprint paper mill. This application is in conflict with one which has been filed by William Randolph Hearst. It reveals that Mr. Cameron plans to erect at the earliest possible date a 200-ton newsprint mill. Eventually he expects to increase the capacity to 500 tons daily. The application makes no estimate of the amount of power which will be available.

I. and J. D. Zellerback of San Francisco have applied to the commission for a preliminary permit covering a project on Revillagigedo Island, Alaska. The power is intended for use in the operation of a paper and pulp mill to be established near the head of Thorne Arm. The applicants propose to make an ultimate installation of 86,000 hp.

The board of directors of state institutions for Arizona has applied to the commission for a preliminary permit for a project on the Colorado and San Juan Rivers in Coconino County, Ariz., and San Juan County, Utah. Under resolution of the commission no consideration will be given this application or any others involving streams in the basin of the Colorado. The

Arizona officials propose to build a dam 693 ft. high at Glenn Canyon site No. 1, which is 4 miles above Lee's Ferry. Such a dam would back up water for 205 miles. The application states that this dam and reservoir are to be an integral part of the Arizona high-line reclamation project. The power is to be used "to supply the power markets of Utah, Colorado, New Mexico and Arizona."

E. G. Hopson of Portland, Ore., has applied for a preliminary permit covering a power project on the Columbia River near Cascade Locks. Power to be developed will, it is understood though not declared, be in excess of 1,000 hp.

The Fargo Engineering Company of Jackson, Mich., has applied for a preliminary permit covering a project on the Kalamazoo River in Allegan County, Mich., at what is known as the Manilus site. The proposed reservoir will contain 6,230 acres. It is proposed to install 3,500 hp.

The commission has assumed jurisdiction over the project of H. A. Spalding and associates on the headwaters of the Cumberland and Tennessee Rivers. It is proposed to construct dams in the Obed River near the mouth of Clear Creek, in the Big South Fork of the Cumberland near the mouth of Pine Creek and in the Obey River 6 miles above Boon, Tenn. While the Chief of Engineers reports that the dams will not impede navigation, he points out that the construction of storage reservoirs on these headwaters might affect navigation adversely.

The commission has adopted an amendment to the license authorized for the Niagara Falls Power Company and the Hydraulic Race Company. The amendment provides for a final division of the residual treaty water between Niagara Falls and Eighteen-Mile Creek. The license contains a condition providing for the measurement of all Barge Canal water, whether diverted above or below the locks at Lockport. The measurement is to be supervised by the representative of the Corps of Engineers at Buffalo, who is the American member of the Niagara Control Board.

Indiana Commission Hears Pleas on Consolidation

Amending the petition of the Indianapolis Power & Light Company for the merger of the Indianapolis Light & Heat Company and the Merchants' Heat & Light Company into a request to declare the Indianapolis Power & Light a public utility and permit it to buy the physical property of the two existing companies, counsel for the petitioning company have ended their argument before the Indiana Public Service Commission. The Indianapolis Power & Light Company, incorporated with $10,000 capital stock the day the petition was filed, would have a valuation of more than $55,000,000. Attorneys opposing the petition contended that consolidation of the two organizations would mean higher rates.

For a whole day the five members of the commission listened to arguments for and against the petition. As stated last week, their jurisdiction in the matter is in question and they will await a ruling of the Attorney-General of Indiana on that matter. Various industrial companies in Indianapolis are jointly opposing the granting of the petition.

New York Edison Puts "Going Value" at $50,000,000

At a continued hearing held in New York City by the New York Public Service Commission to evaluate the New York Edison Company, Francis Blossom of Sanderson & Porter testified last week that the "going value" of the company was "not less than $50,000,000." The going value, he explained, could be approximately defined as the business value with the exception of the property and tangible values.

Former Judge William L. Ransom, counsel for the company, has completed a summary of the amount and present value of the company's property used in the electric business. His figures total $347,686,379, of which $251,426,325 represents land and structural costs and $16,491,416 represents working capital, as estimated by H. M. Edwards, vice-president and auditor. The remainder is made up of $14,884,319 for organization and development expense prior to construction, a like sum for cost of financing and $50,000,000 for the going value.

Justifying the maintenance of storage batteries in the direct-current district, Vice-president John W. Lieb said: "Business in this city could not be carried on commercially without this storage-battery system. I have known where we had to use it 250 times a year. Small concerns would suffer if we did not have it."

First Rumblings of the Short Session

Optimistic Observers Think Congress Will Pass Conference Committee Bill on Muscle Shoals Before Dissolution— Upper Tennessee Permits Favored

BY PAUL WOOTON
Washington Correspondent ELECTRICAL WORLD

THE joint congressional committee on Muscle Shoals expects to meet during the first week of Congress to formulate plans for the handling of its bill. The committee also will consider the adoption of a resolution assuring the Secretary of War that it has no objection to the consideration by the Federal Power Commission of applications for preliminary permits on the upper Tennessee. Senator Deneen of Illinois, the chairman of the joint committee, has stated his intention to press for early passage the bill recommended by the committee. This measure provides for the acceptance of the bid of the thirteen Southern power companies.

While it is certain that this bill will be used as a political football, many think it will be passed at this session. Members of Congress have been at home and have been taunted because of the inability of Congress to dispose of the Muscle Shoals matter. Some advocates of public ownership are anxious to see the matter settled as they recognize that the failure to dispose of this question constitutes a splendid example in favor of the contention that Congress cannot function effectively on business problems. With the exception of Alabama, the South is practically unanimous for the committee's bill. It is easy to understand why Alabama opposes the export of power. Many votes probably will be influenced by the attitude of the legislators from the section most concerned.

The proposed resolution dealing with the upper Tennessee was requested by a delegation of Tennessee business men who came to Washington to urge the Federal Power Commission to act on the applications before it for preliminary permits on the upper river. It was developed that the Secretary of the Interior and the Secretary of Agriculture are ready to act, but as Muscle Shoals comes under the War Department, they are disposed to await the pleasure of Secretary of War Davis. Secretary Davis told the Tennessee delegation that he is not willing to grant a preliminary permit on the upper river until he is sure that such action will not embarrass Congress in its efforts to dispose of the government's Muscle Shoals properties. He will be satisfied if the committee having jurisdiction will adopt a resolution indicating that there will be no objection to action on the upper Tennessee.

No Early Report on G. E. Quiz

Contrary to earlier expectations, the Federal Trade Commission will not be ready to submit the report of its investigation of the General Electric Company until late in this session of Congress. An earlier statement for the commission was to the effect that the report probably would be ready to submit to Congress on its assembly. As the report was completed by the economic division some time since, it is surmised that members of the commission are taking issue with some of the findings of the economists.

Farmers' Representative Sees Coolidge About Shoals

O. E. Bradfute, former president of the American Farm Bureau Federation, conferred on Nov. 26 with President Coolidge with reference to the Muscle Shoals nitrate and hydro-electric plants. Mr. Bradfute favors lease to a private corporation rather than government operation, but believes that if definite action is not taken within a reasonable time government operation will be demanded. The manufacture of fertilizer, in Mr. Bradfute's opinion, should be the major objective rather than the production of electric power for commercial and industrial consumption. Power, not nitrates, should be the byproduct.

Purchases and Mergers

Metropolitan Edison Absorbs York Haven Company—Fitkin Florida Properties to Be Consolidated

APPROVAL by the Public Service Commission of Pennsylvania of the merger of the York Haven Water & Power Company into the Metropolitan Edison Company, the largest subsidiary of the General Gas & Electric Corporation, has finally been extended after a long delay caused by legal technicalities. The Metropolitan Edison Company already owned all of the common stock of the York Haven company.

Formation of the Florida Power Corporation to consolidate the Pinellas County Power Company, Central Florida Power Company and West Florida Power Company has been announced by the Fitkin interests. The consolidated company will serve an area 300 miles by 150 miles, from St. Petersburg, Fla., to Georgia.

The Kentucky Utilities Company has acquired the municipal electric plant at Harrodsburg as the result of a seven-to-one vote of the electorate. Harrodsburg, which is the oldest city in Kentucky, has a population of approximately 5,000. The company has also acquired the municipal plant at Wickliffe.

Approval by the Indiana Public Service Commission of the purchase of the municipal light plant at Gary, Ind., by the Gary Heat, Light & Water Company is asked. The sum of $8,000 was paid for the electric plant, the petition states.

The Interstate Power Company has purchased the St. Ansgar (Iowa) light and power plant from local interests for a consideration of $110,000. L. B. Sherman and Charles W. Berenstein will continue in charge.

The town of Bassett, Iowa, has voted unanimously to sell its municipal plant and distribution system to the Northeastern Iowa Power Company.

The Electric Public Service Company has announced the acquisition of the capital stock of the Colorado Central Power Company, which will own and operate an electric light and power business near Denver, including sixteen communities, with a population of approximately 25,000.

The Southern Edison Company, a subsidiary of the General Power & Light Company, has acquired the municipal light and water plant at Senatobia, Miss., for $79,000.

Sedgwick, Col., has sold its municipal electric plant to the Public Service Company of Colorado. Canton, Tex., by thirteen to one, has voted to sell its to the Texas Power & Light Company. Longport, N. J., will dispose of its system, with certain reservations of plant, to the Atlantic City Electric Company.

Offers to purchase the stock of the Lawrence Gas & Electric Company have been received from the New England Power Association, President I. McD. Garfield of the former company says. Based on three optional offers laid before the stockholders in notices sent them, the sale might involve more than $10,000,000, he is quoted as adding.

A new offer of $335,000 has been made by the Wisconsin Power & Light Company to the City Council of Stoughton, Wis., for its municipal electric system. The citizens rejected the offer which the company made in the spring.

The City Council of Dover, Ohio, has ordered an inventory of the municipal light plant to enable the people to decide whether it shall be sold to the Ohio Power Company for $150,000, offered by a representative of the company.

A petition is now before the New York Public Service Commission for authority to consolidate the Central Hudson Gas & Electric Company of Poughkeepsie, the Dutchess Light, Heat & Power Company of Rhinebeck, the United Hudson Electric Corporation of Poughkeepsie, the Kingston (N. Y.) Gas & Electric Company, the Ulster Electric Light & Power Company of Saugerties and the Upper Hudson Electric & Railroad Company of Catskill into a new corporation to be called the Central Hudson Gas & Electric Corporation. This is in accordance with the directors' plan noted in the ELECTRICAL WORLD for Oct. 30 (page 940.) The six companies supply electricity and gas in cities, villages and towns in Orange, Ulster, Dutchess, Columbia, Greene and Albany Counties.

Lehigh University to Have a New Engineering Building

Plans for a new building to house the mechanical and electrical engineering laboratories at Lehigh University, South Bethlehem, Pa., have been drawn. Experiments for instruction and research purposes will be made possible by apparatus ranging from heavy machinery, boilers, motors and generators to the most delicate of electrical measuring devices. An auditorium seating 500, a museum, drafting rooms, machine shops and an engineering library are included.

The laboratory will be collegiate Gothic in style, with walls of native stone trimmed with cut limestone. It will have an over-all width of 225 ft. and a depth of 184 ft. The largest division of the building will be devoted to the main laboratory, which will be occupied by both the mechanical and electrical engineering departments. Ample provision is made throughout the building for offices and classrooms, as well as for small research laboratories. Cost of the building is put at $1,000,000. Visscher & Burley, New York, are architects.

Engineering Colleges Are Criticised

Fact-Finding Board of Society for Promotion of Engineering Education Recommends Revision of Courses and Enlistment of High-Grade Teachers

SWEEPING criticism of American engineering colleges was contained in a report of the board of investigation and co-ordination of the Society for the Promotion of Engineering Education made public recently at a meeting of the deans and administrative officers of 164 engineeering institutions of the United States and Canada. This report represented the results of a three-year fact-finding investigation just completed in this country and in Europe at a cost of more than $200,000, more than half of this expense being met by the Carnegie Corporation. The investigation was in charge of W. E. Wickenden, who was engaged by the society to direct it.

The board, of which Prof. Charles F. Scott, professor of electrical engineering at Yale, is chairman, holds that science and industry have grown with such rapidity that they have left the technical colleges in the rear, and it is urged that far-reaching changes be put into effect at once in all the engineering colleges of the country in cooperation with the Society for the Promotion of Engineering Education, the national engineering societies, the industries, the secondary schools and the non-engineering colleges. Financial aid from the Engineering Foundation of New York in carrying out such a plan has been promised.

SOME THINGS RECOMMENDED

The report condemns curricula that are "too soft," recommends that the normal length of the undergraduate course should remain four academic years, including increased work in humanistic subjects, and appeals for the elimination of "gross waste in men and money imposed by the present system" through the turning out of graduates who have not the proper training or ability.

"The development of greater social insight and a larger sense of social responsibility should be a definite objective of the engineering profession if it is to gain recognition for more than its technical proficiency," the report declares in recommending that general economics be included in all engineering curricula. At the same time it has need to improve its proficiency in dealing with problems of economy as related to the technical problems of engineering. The ability of the engineer to extend his influence in industrial organizations and in public life, to claim his due share of leadership, and to discharge more adequately his function in society at large, now appears to hinge primarily on his attainment of greater competency and greater recognition on the economic and social side of his work.

"Adequate and sustained emphasis should be given to the bearings of engineering on the broader problems of society and to the social responsibilities of the engineering profession. Due regard for the profession and for the industries and public it serves calls for an educational policy designed to protect and elevate professional standards rather than to increase the number of engineering colleges, to improve the quality of student personnel rather than to expand enrollments. The pressure for more extended provision for technical education and the demand for increased technical personnel should be

met, for the present, by expansion of the facilities and programs of non-collegiate types of training.

"Policies of admission to engineering colleges should have in view the positive attraction and selection of suitable personnel. A joint agency for co-operation with organizations of secondary schools and secondary school teachers should be created. Admission by certificate should be accompanied by more selective methods, including a test of general intelligence, training and aptitude tests in specific subjects, and a physical and health examination."

Concerning the non-graduating student the report says:

"The present proportion of non-graduating students in engineering colleges is plainly excessive and indicates a negative handling of a group of important problems. More positive and constructive measures are needed. The most far-reaching remedy for the present situation is to be sought through selective admission at the outset."

The report stresses the need for action in developing teaching personnel. A critical situation is threatened, it says, because of increasing difficulty in enlisting able men for the highest posts in engineering education. Efforts to broaden and enrich engineering education will be largely unavailing unless teaching service is able to enlist and hold able and inspiring men.

"There is abundant evidence that increasing difficulty is being experienced in filling vacancies of the highest importance, that the most gifted younger men in teaching ranks are not being developed to the same degree as their equals in active life, and that the administrative heads of institutions have not yet given the same concern to attracting and holding men of high professional distinction to chairs of engineering that has been shown in certain other realms of professional education.

"Prompt action should be taken to meet and offset the declining drawing power of the teaching career in engineering before a more critical situation arises. A laisser-faire policy will not meet this situation. Every engineering college should have a carefully worked-out policy and program for enlistment and upbuilding of its teaching staff. The engineering colleges should aim to establish a scale of compensation, including economic protection and retirement features, and a plan of tenure for engineering teachers which correspond closely to the status of engineers of like maturity and of substantial attainments in the more stable industrial organizations."

Southern Plants Inspected

Forty Representatives of Investment and Banking Houses Make Tour of Southeastern's Properties

A GROUP of 40 investment bankers representing 22 companies with combined resources of ten billion dollars or more returned to New York recently after a ten-day tour in the South as guests of the Southeastern Power & Light Company, President Thomas W. Martin acting as official host. The bankers visited the principal plants of the Southeastern subsidiaries, including the Yonah, Tugalo, Tallulah Falls and Terrora hydro-electric developments in Georgia. At Mathis Dam in that state they traveled by boat up Lake Rabun to the Nacoochee development, which has just gone into service, and from there to Burton Dam (see ELECTRICAL WORLD for Nov. 20, page 1085.) After staying at Atlanta and Macon, the bankers journeyed to Mississippi, inspecting the properties at Gulfport, Biloxi and Pass Christian, thence proceeding to Mobile and Montgomery and to the Mitchell and Martin dams in Alabama. From there they went to Birmingham, after which some members of the party returned North while others journeyed to Muscle Shoals.

Especial interest attached to the Martin Dam development at Cherokee Bluffs, Ala., on the Tallapoosa River, because of its being the newest hydro-electric plant belonging to the Alabama Power Company. Two units rated at 45,000 hp. each are now in operation at this site, and a third is almost ready. The plant was described in the ELECTRICAL WORLD for Sept. 25, page 643.

A few of the banking and investment houses which were represented in the excursion were Harris, Forbes & Company, New York and Boston; Drexel & Company, Philadelphia; Irving Bank & Trust Company, New York; Chase National Bank, New York; United Gas Improvement Company, Philadelphia; Bonbright & Company, New York, and Electric Bond & Share Company, New York.

Holding Companies Attacked in Newspaper Propaganda

An organization calling itself the Committee on Coal and Giant Power and claiming to constitute a national group of economists, lawyers, engineers, labor leaders and business men, but otherwise shrouded in anonymity, has put out a statement criticising electrical rates to domestic consumers as too high and attacking holding companies. Analyzing 558 maximum retail lighting rates listed by the New York Public Service Commission, the statement calls reductions in recent years "very slight in view of the increased efficiency of the industry and its claims for the value of financial combination."

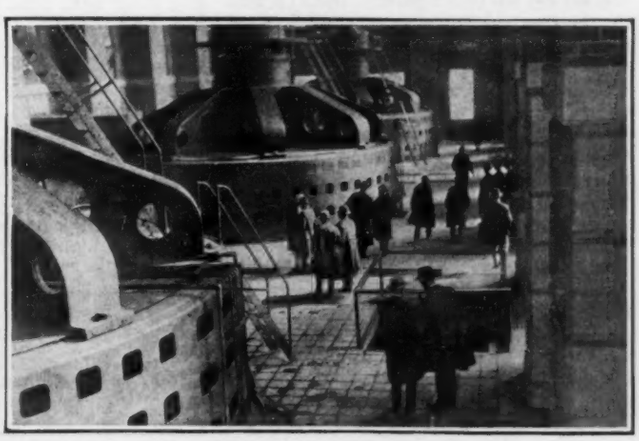
The statement says further that the power companies have done a land office business in acquiring one another, observing: "They have built for themselves a series of superimposed holding companies which not only gather the profits of the operating companies in a less conspicuous manner, but raise a series of problems both for investors in their stock and for the consumers of light and power. Their existence has changed the face of the regulatory question confronting the public service commission. The adequacy of its present power to protect the public is now seriously questioned."

Los Angeles Bureau Completes Two-Year Program

A two-year program of extensions and betterments to the downtown distributing system of the Los Angeles Bureau of Power and Light, necessitating the expenditure of more than $2,500,000, has just been brought to a close, according to an announcement made by E. F. Scattergood, chief engineer for the bureau. This work has virtually quadrupled the capacity of the downtown and commercial districts of the city, and since the major portion of this work has been with underground distribution systems, it has been extremely expensive.

One of the principal features of the Power Bureau's construction in the downtown district has been the change-over from a 2,300-volt distributing system to a 4,600-volt system. In doubling the voltage of its lines, according to Mr. Scattergood, the bureau has increased the carrying capacity of its

VIEWING MARTIN DAM FROM THE DOWN-STREAM SIDE



INSIDE THE POWER PLANT AT MARTIN DAM

cables 400 per cent. As a part of its general construction work in the downtown area, the Power Bureau has built and placed in service a large new distributing station at 936 Francisco Street, is rebuilding and enlarging a second station at 120 East Fourth Street, and now has under construction a third new distributing station, to serve the downtown district, near the intersection of First and Boylston Streets. To eliminate as far as possible interruption to service the work has been carried on for the most part by night working crews.

A.E.C. on Patent Duration and Professional Pay

Besides the action taken by the American Engineering Council on a national program for development of water resources, on organization of a new federal Department of Public Works and Domain and in discouragement of unnecessary questionnaires, as reported Nov. 20 (page 1083), the administrative board at its Ithaca meeting went on record as being definitely opposed to the extension of the time limitation on patents and the enactment of any special patent legislation for the benefit of individuals. Those in charge of the present building program for the United States government were urged to provide better housing facilities for the United States Patent Office out of the appropriation of $50,000,000 available for federal government buildings in the District of Columbia.

The general subject of compensation of professional engineers was widely discussed as the result of a report to the board. This report stated that, because of the major purpose of the American Engineering Council to "support movements affecting public welfare when from an economic viewpoint such movements are believed to be worthy of support," it was the opinion of the committee on compensation of engineers that the council should not enter into the field of discussion just alluded to. According to the report, the "solution is wholly an internal problem of the profession, calling for no publicity, but for self-examination and criticism."

Electrical Credit Men Hold Meeting in Chicago

Meeting in Chicago on Nov. 18 and 19, the Central Division of the National Electrical Credit Association listened to addresses by William R. Dawes, president Chicago Association of Commerce, on "The Business Trend in the Middle West"; by Perry E. Boole, sales manager G-Q Electric Company, Milwaukee, on "Why a Credit Department?" and by W. L. Goodwin, vice-president Society for Electrical Development, on "Responsibilities of Credit Men to the Industry." Discussions were led by Floyd A. Ferguson, W. R. Herstein, H. P. Andrae and others. Three hundred delegates attended. A. V. Willett, Graybar Electric Company, Chicago, was elected president, and J. V. Painter, Appleton Electric Company, Chicago, vice-president.

Briefer News

Boston League Forms S. E. D. Chapter.—The Metropolitan Electrical League of Boston voted unanimously on Nov. 22 to establish a chapter of the Society for Electrical Development and to push the recently devised plan for market development as described at the gathering by William L. Goodwin, operating vice-president of the society.

Rice Lake (Wis.) Council Refuses to Lease Electric Plant.—The City Council of Rice Lake, Wis., has rejected the proposal of the Northern States Power Company to lease and operate the municipal electric and street-lighting systems for ten years (see ELECTRICAL WORLD for Nov. 20, page 1085), and a movement is now on foot to submit the offer to the voters.

Sodus Center, N. Y., to See Second Hydro Plant Built in One Year.—Work has been started on a second hydro-electric plant on Salmon Creek in the town of Sodus Center, N. Y., for the Preston Power Company. It is to be built 4 miles north of the first plant, completed less than a year ago, and will raise the rating of the company to 1,000 hp. By the terms of the contract the work is to be completed early in February.

Maine Company Pushes New Plant in Race Against Time.—Determined to complete its new 5,500-hp. hydro-electric plant at West Buxton, on the Saco River, by the first of the year, the Cumberland County Power & Light Company of Portland, Me., is pushing construction day and night with a large force of workmen. The plant, which will cost between $500,000 and $600,000, will be a semi-automatic one and a valuable addition to the generating resources of the company.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, July 3, page 50.]

American Society of Mechanical Engineers—New York, Dec. 6-9. C. W. Rice, 29 West 39th St., New York.

National Electrical Credit Association—New York Division, Hotel Commodore, New York, Dec. 14; New England Division, Boston, Jan. 18. F. P. Vose, 1008 Marquette Bldg., Chicago.

American Engineering Council—The Mayflower, Washington, D. C., Jan. 13-15. L. W. Wallace, 26 Jackson Place, Washington.

Northwest Association of Electrical Inspectors—Multnomah Hotel, Portland, Ore., Jan. 17 and 18. F. D. Weber, Box 745, Portland.

National Electrical Manufacturers' Association (Supply Division)—New York, Jan. 17-21. F. Nicholas, 30 East 42d St., New York.

Western Association of Electrical Inspectors—Kansas City, Mo., Jan. 25-27. W. S. Boyd, 175 West Jackson Blvd., Chicago.

Electrical Supply Jobbers' Association, Pacific Division—Del Monte, Cal., Jan. 27-29. F. Overbagh, 411 South Clinton St., Chicago.

Artistic Lighting Equipment Association—Hollenden Hotel, Cleveland, Jan. 31-Feb. 5. G. P. Rogers, 424 Guarantee Title Bldg., Cleveland.

American Institute of Electrical Engineers—Midwinter convention, New York, Feb. 7-10; Southwestern District, Kansas City, March 17-18. F. L. Hutchinson, 36 West 39th St., New York.

New York Water Power Commission to Meet Again Next Week.—Another meeting of the New York State Water Power Commission has been called at Albany for Wednesday morning, Dec. 8, when it is said that the commission will take up for final consideration the applications now pending before it for development of St. Lawrence River power. Governor Smith has accepted an invitation from the Survey Associates to make the principal address at a meeting on water power to be held on Monday evening, Dec. 13, at the Hotel Astor, New York City. He will outline his program of power development for New York State.

Tarpon Springs (Fla.) Substation to Control Extensive Transmission System.—The Pinellas County Power Company's station at Tarpon Springs, which will make that city the center of a wide distribution system for the west coast of Florida, is being pushed to completion. A two-story building to house the switch system and the concrete forms which are to hold the transformers will soon be ready on the power company's property, which occupies nearly a city block. Upon completion of this plant high-tension lines carrying energy to St. Petersburg, Clearwater and other cities along the cost will be controlled through this station, which will take $200,000 of the company's two-million-dollar construction program.

Westinghouse Five-Story Arc-Welded Building to Be Inspected.—Erection of an arc-welded five-story steel building at Sharon, Pa., by the Westinghouse Electric & Manufacturing Company is progressing rapidly, and a load test demonstrating the principles involved in the erection of this type of building has been arranged by the company's engineers. This load will be in place on Dec. 15 and 16, and architects, engineers and others interested are invited to inspect the test. A portion of the third floor of the building will be loaded to twice the maximum load for which the floor is designed. It is estimated that 840,000 lb. distributed over an area of 1,400 sq.ft. will be required.

Governor of Georgia Opposes Okefenokee Project. — Governor Clifford Walker of Georgia has addressed to the Federal Power Commission a letter protesting against the project to develop the Suwanee and St. Mary's Rivers by creating a large storage reservoir in the Okefenokee Swamp in south Georgia, in which these rivers have their source. As reported in the ELECTRICAL WORLD for Oct. 30 (page 931), a preliminary permit for this project has been issued. Though disclaiming engineering knowledge, Governor Walker is of the opinion that the

completion of the scheme would be a "calamity unspeakable" on account of the damage he thinks it would cause to land many miles away.

New Ornamental Street Lighting for Oakland.—The City Council of Oakland, Cal., has approved specifications prepared by city authorities for a new ornamental street-lighting system in the downtown section. This will comprise 353 steel ornamental electroliers of special design, each carrying two 1,500-cp. lamps. These standards will be 20 ft. high and spaced 100 ft. apart. It is hoped to have the lamps installed in from six to eight months.

Consumption at Waycross, Ga., Increases 1,000 per Cent in Year.—Consumption of electricity in Waycross, Ga., served by the Ware County Light & Power Company, has increased more than 1,000 per cent in the last year, according to H. A. Neil, now division superintendent for the General Engineering & Management Corporation at Valdosta, Ga., the load jumping from 195 kw. to 2,000 kw. The capacity of the plant, which serves nine towns besides several rural communities, is being raised from 3,000 kw. to 6,750 kw.

Watertown, N. Y., Has New Municipal Street-Lighting System. — Two thousand persons assembled at the State Armory in Watertown, N. Y., last week to see the Mayor turn the switch that put the new city-owned lighting system into operation in place of the former system, which was owned and operated by the Northern New York Utilities, Inc. There are 1,745 lamps belonging to the new system, which was vigorously opposed by the company and many citizens and had to overcome numerous legal obstacles. Voters last July authorized $423,000 in bonds, $252,000 to complete the existing power house and $171,000 for the street-lighting system.

Union Electric Light & Power Company's Building Remodeled.—Enlarged business recently forced the Union Electric Light & Power Company of St. Louis to take over space in its big office building at Twelfth and Locust Boulevards formerly occupied by a tenant. It was then necessary to remodel its sales and service rooms, now filling the first three floors, and these in their new form have just been thrown open to the public. The sales stores are on the first floor, the securities department on the second, and the electrical distribution, industrial sales, commercial sales and appliance repair departments on the third. Thus customers will seldom have to ascend higher.

Oklahoma Eastern District Electrical Men Meet.—"Tree Planting on Highways," a paper by J. A. Whitlow of Tulsa, gave rise to considerable discussion at the meeting of the Electric Light and Power Division (Eastern District) of the Oklahoma Utilities Association at Tulsa on Nov. 26. Other papers were: "Accounting from an Engineer's Standpoint," by B. P. Stockwell of Oklahoma City; "Conditions in Southeastern Oklahoma," by C. H. Kretz of Okmulgee; "Impressions of a Newcomer," by R. W. Curran of Bartlesville; "What Others Are Doing," by R. C. Coffy, Fort Smith, Ark., and "Begin at Home," by M. L. Margenau of Joplin, Mo. O. A. Jennings of Oklahoma City presented the report of the rural lines committee. J. F. Owens was the speaker at the luncheon, over which Fred W. Insull presided.

Of Port Huron's Pioneer Plant "Only Time Remains."—The tablet here illustrated has recently been placed by the Detroit Edison Company in its Port Huron office as a memorial to the three men who started the Excelsior Electric Company on Nov. 17, 1884, operating 24 arc lamps which were distributed among the stores of the town. These men were Henry McMorran, Charles F. Harrington and Wilbur F. Davidson. The clock has been equipped with an electric movement, but except for this change it is the same as when James E. Davidson, now past-president of the National Electric Light Associa-

tion, used to keep the plant log on its indications and A. C. Marshall, now vice-president and general manager of the Detroit Edison Company, labored under its imperturbable and abstract gaze.

Valuation of Laclede Gas Light Company at Last Fixed, but Not Yet Accepted.—After hearings extending over eight years, the Missouri Public Service Commission has put a valuation of $52,260,000 on the property of the Laclede Gas Light Company of St. Louis, of which $5,945,000 is placed on the company's electric department. The company claimed a valuation of $74,795,456, while the city tried to hold it down to $40,000,000. It is anticipated that the company will appeal to the courts.

N.E.M.A. Supply Division Meetings. —The Supply Division of the National Electrical Manufacturers' Association and the sections of that division, including the Radio Section, will hold their semi-annual meetings in New York from Jan. 17 to 21, inclusive. The meetings of the Radio Section will be at the Old Colony Club, Waldorf-Astoria Hotel, from Jan. 19 to Jan. 21, concluding with a banquet on Friday evening. Meetings of the other sections of the division will be held at the association office, 30 East Forty-second Street, and the Hotel Roosevelt from Jan. 17 to 21. A general meeting of the division will be held on Wednesday afternoon, Jan. 19, at the Hotel Roosevelt. A banquet of the Supply Division will follow in the evening of the same day.

New Unit at Valmont Plant Goes Into Operation. — A good-sized crowd saw the Mayor of Boulder, Col., formally put the second unit of the Valmont steam-electric plant of the Public Service Company of Colorado in commission on Nov. 24. Speeches were made by Vice-president Charles A. Semrad of the company and A. E. Howe, president of the Boulder Chamber of Commerce. The new unit is rated at about 27,500 kw. and brings the capacity of the plant up to 50,000 kw. (See ELECTRICAL WORLD for Oct. 16, page 821).

Denver Situation at a Standstill.—Negotiations in the matter of a new Denver franchise for the Public Service Company of Colorado came to a seeming deadlock on Nov. 24, according to Vice-president Stannard of the company, over the question of rates. Mr. Stannard characterizes the reductions asked by the city officials as unreasonable and says they would jeopardize the ability of the company to carry out its program of development. The rates desired by the company were printed in the ELECTRICAL WORLD for Nov. 13 (page 1030). An adjustment of the dispute is still hoped for.

Electrical Growth in Ottawa-Montreal District.—The annual report of the Ottawa-Montreal Power Company records that from Grenville to Ile aux Chats and from Ile aux Chats to Lachute a 26,000-volt line has been built for the purpose of interconnecting the plants on the Rouge River with those on the North River. A new 13,000-volt line has been built from Mirabel for the purpose of increasing the capacity of supply to Ste. Scholastique and also to serve Belle River, St. Benoit and St. Hermas. The company has also acquired the distributing system in Lachute and Ile Perrot. These properties have added approximately 30 miles of distribution lines to the company's system.

West Penn Power Opens New Pittsburgh Substation. — The West Penn Power Company has just completed at Pittsburgh a new substation costing $600,000. John L. Bennett, district superintendent, has announced that energy for the station is supplied direct from the West Penn generating station at Springdale, 23 miles away, over a new 66,000-volt, double-circuit, steel-tower transmission line. This line is insulated for 132,000 volts and cost $650,000. Radiating from the new substation are eight 25,000-volt transmission circuits, two to the new Butler plant of the Forged Steel Wheel Company, one to the Standard Plate Glass Company, one to Kittanning, two to Freeport, one to East Butler and one to Branchton.

Men of the Industry

J. F. Fairman of Brooklyn Edison Receives Promotion

J. F. Fairman, formerly outside plant engineer of the Brooklyn Edison Company, has been promoted to the position of assistant electrical engineer of that company. Mr. Fairman's affiliation with the Brooklyn Edison Company dates back to October, 1925, when he became assistant outside plant engineer, having been made outside plant engineer six months later. He is a native of Big Rapids, Mich., and a graduate of the University of Michigan in electrical engineering. Following the completion of the student course with the Westinghouse Electric & Manufacturing Company, Mr. Fairman joined the teaching staff of the University of Michigan, where he remained until he identified himself with the Brooklyn Edison Company.

W. B. Kirke, formerly protection engineer with the Brooklyn Edison Company, has been appointed outside plant engineer, and **J. A. Brooks** has been appointed assistant outside plant engineer.

W. O. Haymond has been appointed manager of the Muncie district of the Indiana General Service Company to succeed Roy L. Thurman, resigned. Mr. Haymond has been in the service of the company for 23 years.

H. G. Johnson, formerly connected with the General Electric Company in the research laboratory at Nela Park, Cleveland, has joined the Railway & Industrial Engineering Company staff at that city. Mr. Johnson will cover the eastern section of Ohio.

Paul Galle, distribution engineer of the Ohio Public Service Company at Elyria since 1924, has resigned to return to his home in Massachusetts. Ill health has forced Mr. Galle to sever his connection with the Public Service Company.

Clarence W. Kinney, formerly electrical engineer of the Economy Electric Company, Worcester, Mass., and well known in the industrial power field in central Massachusetts, has opened an office as consulting engineer at 58 Front Street, Worcester.

T. R. Fluker, formerly of Quitman, Ga., is now identified with the General Engineering & Management Corporation at Waycross, Ga., in the capacity of manager of the Ware County Light & Power Company. Mr. Fluker had been city manager of Quitman for the past five years, and prior to that connection he was superintendent of the water and light department at Griffin, Ga.

Burton L. Delack, assistant manager of the Erie works of the General Electric Company, has been appointed assistant manager of the Schenectady works, effective Dec. 1. **John St. Lawrence,** general superintendent at Erie, had been named to succeed Mr. Delack. Mr. Delack entered the employ of the General Electric Company in 1903, soon after his graduation from the Clarkson College of Engineering at Potsdam, N. Y. Subsequently he was transferred from the test to the railway motor engineering department and later was appointed manufacturing engineer and transferred to the Erie works. In the summer of 1923 he was named assistant works manager at Erie. Mr. St. Lawrence has been with the General Electric Company since 1913.

John H. Trumbull, president and a director of the Trumbull Electric Manufacturing Company, Plainville, Conn., who is Governor of Connecticut, was elected a director of the Hartford Steam Boiler Inspection & Insurance Company on Nov. 24.

James Hill, Jr., has been appointed superintendent of electric distribution of the Shreveport (La.) division of the Southwestern Gas & Electric Company. Mr. Hill has been associated with the Southwestern organization since 1922 as assistant electrical superintendent.

A. D. McWhorter, Jr., has become affiliated with the Carolina Power & Light Company in Raleigh, N. C. Mr. McWhorter is a graduate of the University of Tennessee, and during the past year he was associated with the General Electric Company at Schenectady and Erie.

J. F. Duffy, formerly assistant industrial heating engineer of the Edison Electric Illuminating Company of Boston, is now sales engineer of the Detroit Electric Furnace Company, Detroit. **George Pierce** has been appointed to handle Mr. Duffy's former work at Boston.

Carl Wurtzbach, manager of the Lee branch office of the Pittsfield (Mass.) Electric Company, was elected president of the Berkshire Hills Conference, a body formed to advertise and build up the interests of Berkshire County, in the same state, at the annual meeting of the organization in Pittsfield, Nov. 9.

John W. Campbell will assume the duties of secretary of the Public Service Commission of Missouri Jan. 1 to succeed State Senator Larry Brunk of Aurora, who has been named secretary of the newly formed Workmen's Compensation Commission for Missouri. Until the appointment becomes effective Mr. Campbell will be employed by the commission in some other capacity.

Sir Charles A. Parsons, eminent British engineer and scientist, was made the recipient of the Kelvin medal for 1926, the award having been made at a meeting of the Institution of Civil Engineers of Great Britain held Oct. 26. The Kelvin gold medal was established in 1914 as part of a memorial to the late Lord Kelvin and is awarded triennially by a standing committee consisting of the presidents of the principal representative British engineering institutions. Sir Charles is especially known for his work in connection with the development of the steam turbine, though he has to his credit other valuable inventions.

Reuben B. Sleight, who has been the engineer of the Minnesota Tax Commission since 1922, has accepted a position as assistant to Herbert Hoover, Secretary of Commerce. He will do research work on subjects pertaining to the electrical industry. Mr. Sleight succeeds Paul S. Clapp, who resigned recently to become managing director of the National Electric Light Association.

H. A. Neil, formerly manager of the Ware County Light & Power Company, Waycross, Ga., has been promoted to the position of division superintendent for all the construction work and new installations in that division of the General Engineering & Management Corporation, with headquarters in Valdosta. Previous to his connection at Waycross Mr. Neil was connected with the Niagara, Lockport & Ontario Power Company at Lyons, N. Y.

O. E. Grim, chief engineer of the power plant of the Edison Light & Power Company, York, Pa., has been appointed superintendent of power stations and substations. Mr. Grim entered the employ of the Edison company in 1902, advancing through frequent promotion to the office of chief engineer of power plant in 1918. **Howard Hinkle,** assistant chief operator of the power plant, has been promoted to be chief engineer. Mr. Hinkle was first employed by the Edison company in 1915 as relief operator and engineer, three years later being made assistant chief engineer.

Obituary

Alves Dixon, recently manager of the Baton Rouge (La.) Electric Company and for more than twenty years identified with the organization of Stone & Webster, Inc., died recently at El Paso, Tex.

Colonel William G. Dows, president of the Iowa Railway & Light Company, Cedar Rapids, Iowa, died Nov. 25 at the University Hospital, Iowa City. In addition to being widely known in public utility and industrial circles, Colonel Dows was prominent for many years in Republican politics in Iowa. He was a native of Iowa and received his education in the public schools of Cedar Rapids, at Coe College and at the Shattuck Military Academy, Faribault, Minn. Returning to Cedar Rapids, he later became instrumental in the organization of the Iowa Railway & Light Company and its subsidiaries. Colonel Dows was 62 years of age.

Charles E. Livingston Thomas, vice-president of the Bronx Gas & Electric Company, New York City, died at Bronxville, N. Y., on Nov. 30 in his forty-fifth year. For several years Mr. Thomas represented the Nicholas F. Brady interests in the management of that family's large gas holdings in Japan. When Mr. Brady sold the property recently Mr. Thomas returned to this country and became an executive of the Consolidated Gas Company. A few months ago he was elected to the vice-presidency of the Bronx Gas & Electric Company.

Commission Rulings

New York Commission to Keep Close Track of Interruptions in Service.—The New York Public Service Commission has issued an order requiring all electric, gas and steam corporations to report interruptions to service having a duration of five minutes or more. The commission has found from experiment that the information is valuable, holding that such reports increase the watchfulness of the companies and enable the commission to advise complainants promptly concerning delays or to take action to prevent such failure. Immediate notice by telephone or telegraph is required of all interruptions to service having a duration of fifteen minutes or more.

Separate Departments of Utility Considered as Units in Fixing Rates, Notwithstanding Precarious Condition of Railway.—A discussion of the right policy to pursue in fixing rates for a utility with electric, gas and street-railway departments is contained in a majority memorandum filed by the New York Public Service Commission in adjudicating a petition from the city of Elmira asking reductions in the rates of the Elmira Water, Light & Railroad Company. This memorandum says: "The company contends that the Public Service Commission should view each public utility in the light of its peculiar situation in its particular community. If the convenience and welfare of the community is to be maintained by the commission only by consideration of the service utilities as a single entity, the commission has no higher duty than to effectuate such an arrangement. The circumstances in the case of the Elmira company are such that the consideration of the electric, gas and railroad utilities for rate-making purposes as separate companies might be to deprive the community of the railway. The city, in its briefs, concedes that the railway, by any valuation, does not earn a fair return. The patronage of the railway has been decreasing for a number of years, and there is a very definite point at which the loss of passengers will offset the increase in revenue derived from an increased fare. It is probable that a 10-cent fare would be the most the traffic would stand. Any higher rate than that would cause a loss in revenue, and even that fare will not give a reasonable return upon any value which could be placed on the railway property. If the revenues should be pooled, the losses of the railway would be approximately equal to the excess profits of the electric department, thus enabling the company to maintain a utility which is essential to the welfare of the city. The city takes the position that each of the three utilities must stand upon its own feet and that it is unfair to the consumers of one utility to make them pay the losses sustained by another utility of which they may or may not be customers. The commission has heretofore held in matters connected with the city of Elmira that the above proposition was correct. If the citizens of Elmira do not by their patronage of the street railroad allow the utility to obtain a fair return upon the money invested, we know of no way to compel them to do so, and if such situation continues, the utility will have to suffer the fate of other transportation companies which have been superseded by newer, more convenient and popular means of travel. We hold therefore, in this case, that each of these utilities must be considered separately, and to that end we proceed to an examination of the property of each, its operating revenues and expenses." Commissioner Van Voorhis, in dissenting from the majority memorandum, held that the three complaints should be determined at the same time and that consideration should be given to the various departments of the company as a whole in determining reasonable and just rates.

Recent Court Decisions

United States Supreme Court Finds New York's "Dollar-Gas" Law Confiscatory.—The law passed by the New York Legislature in 1923 fixing $1 per 1,000 cu.ft. as the legal rate in New York City, which has repeatedly been declared confiscatory by lower courts, has now received its quietus in a decision of the United States Supreme Court disposing of three cases carried to it by the Attorney-General of New York on appeal. In these cases the companies claimed that the prescribed rate would reduce their return below 6 per cent or, in one case, below 5 per cent. The cases affect the Consolidated Gas Company, the Brooklyn Union Gas Company and the Kings County Lighting Company. The Supreme Court, however, directed a modification of the parts of the previous decrees which held the statute invalid "for any reason except conflict with the Fourteenth Amendment because confiscatory in effect." The New York Public Service Commission did not join in the appeal.

Supreme Court Defines Powers of Federal Trade Commission.—In three cases decided jointly the United States Supreme Court held that the Federal Trade Commission, under authority of the Clayton act, has no power to order a corporation to divest itself of physical property of a former competitor unless action has been taken prior to such acquisition, but that the remedy is through the courts if competition be stifled. The decisions were in cases involving acquisition of stock of a competitor and are interpreted as curbing the activities of the Trade Commission. The commission may, however, order a corporation to divest itself of stock of a competitor where no actual merger of physical assets has taken place, the decisions say, in effect. In the appeal of the Federal Trade Commission against the Western Meat Company the court, through Justice McReynolds, held that the lower court erred in modifying the commission's order so as to eliminate from it an injunction against acquisition of physical propertes. As modified, the decision of the lower court was affirmed, thus giving the Trade Commission a victory in this case and meaning that the defendant will have to divest itself of stock ownership in a former competitor. In the appeal of the Thatcher Manufacturing Company against the commission the court reversed the finding of the lower court, which had upheld the commission's order directing the Thatcher company to divest itself of ownership of plants of three former competitors. In this case the purchased glass companies had been dissolved. In the appeal of Swift & Company the court also reversed the lower court, which had affirmed an order by the commission directing the Swift company to divest itself of physical assets of two former competitors. In the Thatcher case the Supreme Court held that "the [Clayton] act has no application to ownership of a competitor's property and business obtained prior to any action by the commission, even though this was brought about through stock illegally held." Justice Brandeis dissented in the Thatcher and Swift cases.

Argument that Lineman Killed by Grasping Traction Cable Would Have Grasped Guard Instead Had There Been One Justified.—The Supreme Court of New Hampshire in reviewing a case (Derosier vs. New England Telephone & Telegraph Company) where damages had been awarded because of the death of a lineman owing to careless maintenance of telephone poles found justified a contention that the man, who in an attempt to save himself from falling grasped a traction cable, would instead have grasped a guard had there been one. An exception to the charge that if negligence of the traction company combined with the fault of the defendant liability might still be found was, however, not admitted. (134 At. 719.)*

Constitutionality of South Carolina Act Authorizing Cities to Sell Municipal Plants Upheld.—McKiever vs. City of Sumter was an action brought to maintain a decree enjoining the city from making a conveyance of its electric and ice plant to the Yadkin River Power Company under the terms of an act passed by the South Carolina Legislature in 1925. This act was attacked as unconstitutional on the theory that it was special legislation. It was also contended that the notice of the public vote on the question was insufficient and that the franchise was illegal as constituting an amendment to the city's charter. Declaring these contentions unfounded, the Supreme Court of South Carolina reversed a decree granted by a lower court. The Supreme Court asserted that an election held in Sumter on Nov. 17, 1925, when the proposed sale was approved by 349 to 303, was a sufficient compliance with the terms of the act and that the city should be required to carry out the requirements of its contract with the company. (135 S. E. 60.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Financial and Corporate

Utility Markets Steady

Gains Have Exceeded Losses During Week, but Few Have Been More than Marginal—Few Bond Defaults

IN COMPARISON with last week considerable strength is displayed in the markets for power and light stocks. Demand is more marked than for two or three weeks, but the influence of the security markets in general is seen in the more or less purposeless movement which has left quotations little above or below those of a week ago.

Among the common stocks losses and gains were about evenly divided. Marginal rises were made by such stocks as Edison Electric Illuminating of Boston, which has gained five points in two weeks; Brooklyn Edison, American Gas & Electric, Pacific Gas & Electric and American Light & Traction. The average price of a representative group of fifteen stocks is one point higher than the average of a week ago. The situation among the preferred issues is similar.

Demand for the better-grade utility bonds continues to increase. Figures published this week show a decided drop in defaults on utility bonds. The total on Nov. 1 shows a decrease of $11,000,000 from the figure for the corresponding date last year. The list, of course, contains few gas, electric or water companies, being made up largely of tractions.

Customer Sales Amount to $20,000,000 in September

Based upon monthly reports received by the ELECTRICAL WORLD from electric light and power companies selling stock direct to their customers and employees, it is estimated that during September a total of 251,000 shares were sold in this manner. The value of the stock sold is estimated at $20,000,000. A total of 29,000 customers took part in the sales during September.

New Financing for Great Western-San Joaquin

Application has been made to the California Railroad Commission by the Great Western Power Company and the San Joaquin Light & Power Corporation, both properties controlled by the Western Power Corporation, which in turn is held by the North American Company, to issue and sell certain securities.

The Great Western Power Company of California asks permission to issue and sell $1,000,000 par value of 6 per cent preferred stock at not less than $93 a share and to issue and sell to the Western Power Corporation $2,500,000 par value of common stock at $50 net, and to apply the proceeds to the reimbursement of its treasury for capital expenditures. The San Joaquin Light & Power Corporation asks to issue and sell to the Western Power Corporation $2,000,000 par value of its prior preferred series "A" 6 per cent stock at $95 per share, plus accrued dividends, and to issue $1,000,000 of that stock additional and sell it through its own organization at not less than $93; also to sell to Western Power Corporation $4,000,000 par value of common stock at $50 per share.

Almost coincidentally with the above applications, the Western Power Corporation, New York, offered for sale $10,000,000 of its series "A" 5½ per cent convertible collateral trust gold bonds. Collateral pledged consisted of more than a majority of the outstanding stock of the Great Western Power Company, San Joaquin Light & Power Corporation and the Midland Counties Public Service Company.

General Gas & Electric Simplifies Set-up

Number of Subsidiaries Greatly Reduced—Operating Companies Placed in Stronger Position to Obtain New Funds for Expansion

BY W. S. BARSTOW
President General Gas & Electric Corporation

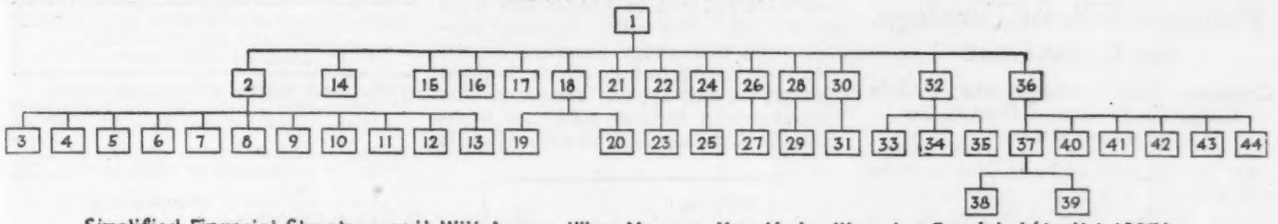
THE General Gas & Electric Corporation is a security investment corporation, confining its permanent investments to the junior securities or common stocks of its public utility operating companies, except in one case where it holds all the securities of the General Finance Corporation. The General Finance Corporation is used principally as a vehicle for acquiring small properties adjacent to subsidiary companies, causing them after reorganization to be merged directly with the operating properties. In such transactions there is no profit to the Finance Corporation, the operating company acquiring the properties at the same price as they are acquired by the General Finance Corporation.

As the General Gas & Electric Corporation confines its permanent investments to common stocks, it is vitally concerned in safeguarding the integrity of its operating companies both as to physical and financial operations in order to protect the value of its own investment. The maintaining of simple financial structures of the subsidiary companies so that these companies can readily and economically provide new moneys for the expansion of their physical properties is the foundation upon which the structure of the investment holding company must rest. The financial structure of the operating companies, and therefore of the investment holding company, depends upon the values of the operating properties directly serving the public and on which the state public service commissions have fixed a permissible rate of return. Thus dividends on securities held by the investment company are directly related to the returns on that part of the operating company securities which the investment company owns. The market value of the investment company's securities is affected by the ability of the operating company to earn its full permissible rate of return, if not immediately, then in the future through improved financial and operating management.

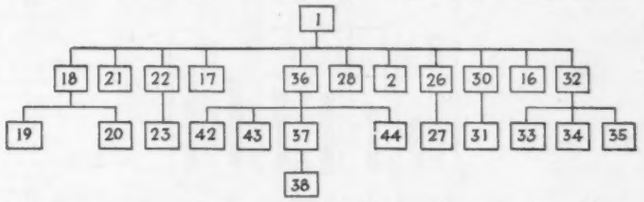
As the financial structure of the operating company expands through the sale of senior securities to the public, it is necessary for the investment holding company, in order to preserve the maximum efficiency of the structure of the subsidiary company, to increase from time to time its investment in common stocks of such subsidiary company. This the General Gas & Electric Corporation does from funds secured by the sale of its preferred and common stocks, the corporation having no bonded debt.

A security investment holding company must, however, be prepared at all times to keep its own financial structure simple and safe so that it may aid from time to time the subsidiary companies in every way possible, as by so doing it can best protect the value of its investments. In order that the subsidiary company may secure the best market price from the public on its senior securities, the investment company is often called upon to loan, at prevailing rates, sums of money to a subsidiary company in the intervals between the sales of its senior securities to the public, during which intervals money is spent on construction. The control of such loans should to a very large extent be in the hands of the investment holding company as such loans directly affect the value of the junior investments. Thus the investment holding company, besides investment in the junior securities, must create a revolving fund as a continuous protection to its investment. Such a revolving fund soon becomes a frozen loan, and its value for the purposes of such fund disappears if the financial structure of the subsidiary company does not permit of the issue and sale of its own securities to pay back the loans. Therefore the aim of every security investment holding company must be to see that not only its own financial structure but that also of its subsidiary companies is simple and sound, so that the securities of both companies are marketable on the best possible basis.

Present Financial Structure



Simplified Financial Structure as it Will Appear When Mergers, Now Under Way, Are Completed (April 1, 1927)



Names of the Companies Referred to by Numbers in the Above Charts

1. General Gas & Electric Corporation.
2. The General Finance Corporation.
3. Ortanna Electric Light & Power Company.
4. The Boyertown Electric Company.
5. Annville & Palmyra Electric Light Company.
6. Bernville Light, Heat & Power Company.
7. Berks-Lehigh Electric Company.
8. Birdsboro Electric Company.
9. Saylorsburg Light & Power Company.
10. Hamburg Gas & Electric Company.
11. Topton Electric Light & Power Company.
12. Weisenberg Township Electric Light & Power Company.
13. The French Creek Electric Company.
14. Newton Gas Company.
15. New Jersey Power Corporation.
16. Binghamton Light, Heat & Power Co.
17. The Jersey Corporation.
18. North Carolina Public Service Co.
19. The Salisbury & Spencer Railway Co.
20. Greensboro Bus Company, Incorporated.
21. Florida Public Service Company.
22. The South Carolina Gas & Electric Company.
23. Spartanburg Bus Company.
24. Manufacturers' Power Company.
25. Blue Ridge Power Company.
26. Broad River Power Company.
27. Columbia Railway, Gas & Electric Company.
28. New Jersey Power & Light Company.
29. Washington Gas Company.
30. Northern Pennsylvania Power Co.
31. The Waverly Electric Light & Power Company.
32. Reading Transit Company.
33. Reading Transit Bus Company.
34. Oley Valley Railway Company.
35. Leased Companies:
    - Northeastern Street Railway Company of Reading.
    - The Reading & Southwestern Street Railway Company.
    - Adamstown & Mohnsville Electric Railway Company.
    - Reading Traction Company:
        - The Reading & Temple Electric Railway Company.
        - The Reading City Passenger Railway Company.
    - East Reading Electric Railway.
    - Lebanon Valley Street Railway.
    - Schuylkill Valley Traction Company.
    - Citizens' Passenger Railway Company.
    - Norristown Passenger Railway.
    - Montgomery County Passenger Railway Company.
    - Conshohocken Railway Company.
    - Collegeville Electric Street Railway Company.
    - Roxborough, Chestnut Hill & Norristown Railway Company.
    - The Trappe & Limerick Electric Street Railway Company.
    - Wissahickon Electric Passenger Railway Company.
36. Metropolitan Edison Company.
37. Pennsylvania Edison Company.
38. Easton Gas Works.
39. Interurban Gas Company.
40. Metropolitan Power Company.
41. York Haven Water & Power Company.
42. Hanover & McSherrystown Street Railway Company.
43. The Maryland Public Service Company.
44. Leased Companies:
    - Neversink Light, Heat & Power Company.
    - Reading Electric Light & Power Company.

Upon the acquisition of an operating company by the General Gas & Electric Corporation the simplification of the financial as well as the physical structure of that company receives immediate attention. An illustration of the difficulty and delay often encountered in simplifying the financial structure of an operating company—in this instance a subsidiary of the General Gas & Electric Corporation—was the case of the York Haven Water & Power Company, doing a hydro-electric business in a territory adjoining that served by the Metropolitan Edison Company, one of the largest subsidiaries of the corporation. The stock of the York Haven company was acquired by the Metropolitan Edison Company with approval of the Public Service Commission at a time when the former had little additional borrowing power because the property was covered by first, second and third mortgages. Soon after the acquisition of the stock steps were taken to merge the two companies so as to create one company with a simple financial structure. A widespread impression prevailed at that time among Pennsylvania lawyers that, because of the merger requirement of a similarity of business, a water and water-power company could not be merged with what is commonly known as a steam-electric company. The York Haven company had been chartered to supply water as well as water power in the Borough of York Haven. It had perhaps at the time of its incorporation no right to manufacture and distribute electrical energy. In 1895 an act was passed by the Legislature giving it this right and the further valuable right to run its distribution lines to any point or points in the state. The company has never supplied water, but the existence of that charter right prevented it, so it was argued, from merging with a company like the Metropolitan Edison Company, chartered under the electric companies act of 1889. The Public Service Commission adopted this view and disapproved the merger. Its order was affirmed by the Superior Court in the face of the fact that the two companies were doing precisely the same business —that is, selling electrical energy—the only difference between them being the kind of motive power applied to the turbines. On appeal to the Supreme Court of the Commonwealth the order of the Public Service Commission and the decision of the Superior Court were unanimously reversed on condition that the company should surrender its power to supply water. This has been done, and, in obedience to the decision of the Supreme Court, the Public Service Commission has issued its certificate of public convenience evidencing its approval of the merger. More than two years were consumed in the proceedings, and the purchasing company was subjected to the attendant financial and legal expense.

Frequently it happens that it is not to the best interest of public or investors to carry mergers to final completion if such mergers weaken rather than strengthen the financial structure. This is the case of electric railway and electric power companies, where generally a merger weakens rather than strengthens the financial structure of the power company, which is called upon to make the larger yearly capital expenditure of the two. Again, the merger of two companies doing business in adjacent territory but in different states is not legally possible in a majority of cases. Very often the expense of a merger would more than offset its advantage. This is true in the case of the Pennsylvania Edison Company and the Metropolitan Edison Company, where the provisions of the mortgage of the former necessitate, in case of merger, the retirement of the entire issue of its bonds at an expense which would offset any advantage to be gained by financially uniting the two.

The financial structure of the General Gas & Electric Corporation is shown as it will be about April 1, 1927, when mergers now under way are completed and it will have reached a simplification in keeping with the best interests of the public and all investors.

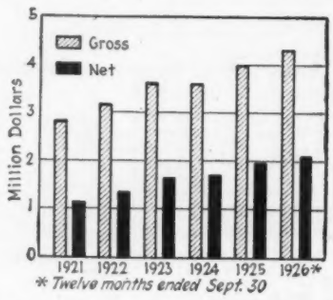
The subsidiaries whose common stocks are owned directly by the corporation have a property value of more than 85 per cent of the total, while the subsidiaries whose common stocks are owned indirectly by the corporation have a property value of less than 15 per cent of the total.

Potomac Edison Earnings up 8 per Cent

Company Has Reduced the Unduly Large Proportion of Debt in Its Capital Structure

AN INCREASE of 7 per cent in gross revenue and 8 per cent in net is shown in the financial report of the Potomac Edison Company for the year ended Sept. 30. This brought the former to $4,323,547 and the latter to $2,132,698. The company's production rose nearly 5 per cent to 165,947,915 kw.-hr., serving 35,843 electric customers. A detailed analysis of the company's set-up, earnings and financial position is embodied in the accompanying table.

One of the first features noted in a study of the capital set-up and operations of the Potomac Edison Company is the high proportion of debt in the capitalization. At the end of 1925 bonded indebtedness constituted 76 per cent of total capitalization, or 74 per cent when the surplus is considered. It should be stated, however, that the common stock of the company has been increased since that time from 75,000 shares to 120,000 shares, and the bonded debt, including an issue made last month, is reduced to $14,500,000 from $15,809,100. The ratio between capitalization and gross earnings is approximately five to one, which is about average for this type of company. The ratio between bonded debt and gross earnings is nearly four to one, which is



GROSS AND NET EARNINGS OF POTOMAC EDISON FOR 1925

higher than normal for a company with the majority of its operations in steam plants. The value of plant and equipment at the end of 1925 was given as $20,946,499 against a total asset value of $24,629,803.

Turning next to the company's operations, it is found that the gross earnings were approximately twice operating expenses at the end of September of this year. This proportion runs from as low as 30 per cent for companies with hydro-electric generation and

SET-UP, EARNINGS AND FINANCIAL POSITION OF POTOMAC EDISON COMPANY

1. **Financial Set-Up** (December, 1925):
   - Ratio debt to capitalization, 74 per cent.
   - Ratio gross revenue to capitalization, 1 to 5.
   - Ratio funded debt to gross, 4 to 1.
   - Ratio investment to capitalization, 101 per cent.
   - Ratio investment to gross, 5 to 1.
2. **Revenue Record:**
   - Ratio gross to operating expenses, 2 to 1.
   - Ratio revenue to total assets, 1 to 5.
   - Ratio gross earnings to net revenue, 2¼ to 1.
   - Times bond interest earned, 2¼ times.
   - Preferred dividend earned, $19.75.
   - Preferred dividend paid, $7.00.
   - Earnings compared with whole industry—More rapid increase.
   - Depreciation to gross, 8 per cent.
3. **Trust Investment Tests:**
   - Life of franchise after bond maturity—Several years.
   - Percentage debt to book value of property, 71 per cent.
   - Size of gross, $4,323,547.
   - Size of net, $2,132,698.
   - Is mortgage modern? Yes; open-end; subject to modification.
4. **Business Progress:**
   - Ratio of kilowatt-hours sold to gross, 73 per cent.
   - Kilowatt-hours sold per customer, 4,629.
   - Revenue per customer, $120.62.

Stock Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday Nov. 30	Low 1926	High 1926
ABITIBI PWR. & PAPER, com. —no par	89¼	70¼	98
Adirondack Pwr. & Lt.—7% pf.	104	....	....
Adirondack Pwr. & Lt.—8% pf.	111	....	....
Ala. Pwr., pf.	108	....	....
Allis-Chalmers Mfg. pf.	110¼	105	110¼
Allis-Chalmers Mfg., com.	87¼	78¼	94¼
Aluminum Co. of Amer., com.	70	....	....
Aluminum Co. of Amer. pf.	102	....	....
Amer. & Foreign Pwr., pf. 25% pd.	m110	....	....
Amer. & Foreign Pwr., 7% pf.—no par	84¼	79	98
Amer. & Foreign Pwr., com.—no par	16¼	14¼	42¼
Amer. Bosch Magneto, com—no par	16¼	16	34¼
Amer. Brown Boveri, Elec.	30¼	30¼	50
Amer. Brown Boveri, Elec., pf.	96	86¼	97¼
Amer. Gas & Elec., 6% pf.—no par.	96¼	90¼	96¼
Amer. Gas & Elec., com.—no par.	106¼	64	110¼
Amer. Lt. & Trac., 6% pf.	132¼	105	132¼
Amer. Lt. & Trac., com.	242¼	193	263
Amer. Pwr. & Lt., 6% pf.	98¼	92	99¼
Amer. Pwr. & Lt., com.—no par.	m 66¼	50¼	72
Amer. Pub. Serv., 7% pf.	96	....	....
Amer. Pub. Serv., com.	50	....	....
Amer. Pub. Utilities, 6% pf.	74	....	....
Amer. Pub. Utilities, 7% pf.	87	....	....
Amer. Pub. Utilities, com.	m 66	....	....
Amer. States Sec., A	2¼	....	....
Amer. States Sec. B	3	....	....
Amer. Superp wr., pf.—25	26¼	23	26¼
Amer. Superp ower, pf.	£ 95¼	....	....
Amer. Superpwr., Class A—no par.	£ 29	19¼	37¼
Amer. Superpwr., Class B—no par.	31¼	21¼	39¼
Amer. Wtr. Wks. & Elec., 7% pf.	£102¼	101¼	108¼
Amer. Wtr Wks. & Elec., com.—20.	59	48¼	74
Anaconda Copper	47¼	41¼	51¼
Appalachian Elec. Pwr., 7% pf.	....	....	....
Appalachian Ele . Pwr., 1st pf., 7%.	98	....	....
Appalachian Elec. Pwr., com.	m 78	....	....
Arizona Pwr., 7% pf.	76	....	....
Arizona Pwr., com.	22¼	....	....
Arkansas Cent. Pwr., pf., $7—no par	101	....	....
Arkansas Lt. & Pwr., 7% pf.—no par	100	....	....
Arkansas Lt. & Pwr., com.—no par.	100	110	115
Asheville Pwr. & Lt., 7% pf.—no par	£107¼	100¼	107¼
Assoc. G. & E., pf.—$3.50—50	50	....	....
Assoc. Gas & Elec., pf.—$6—no par	83	....	....
Assoc. Gas & Elec., Class A—no par	34¼	25¼	38¼
BABCOCK & WILCOX, com.	117	....	....
Binghamton Lt., Ht. & Pwr., pf.	91	....	....
Birmingham Elec. pf.—$7—no par.	105	....	....
Blackstone Valley Gas & Elec., pf.	103	103	106
Blackstone Valley G.&E., com.—50.	103	....	....
Blaw-Knox, com.	t 74	45	80
Brazilian Trac., Lt. & Pwr., com.	m104	....	....
Broad River Pwr., pf.	94	....	....
Brooklyn Edison, com.	157¼	133	163
Buffalo, Niagara&East Pwr.,pf.—25.	£ 24	....	....
Buffalo, Niagara & Eastern Pwr., com.—no par.	£ 30¼	....	....
CALIFORNIA ELEC. GENERATING, pf.	93	....	....
California Ry. & Pwr., pf.	130	....	....
Carolina Pwr. & Lt., pf.—$7—no par	107¼	....	....
Cent. & S. W. Ut. 7% pf.—no par .	90	....	....
Cent. & S. W. Ut., pr. ln. pf.—no par	98	....	....
Central Ariz. Lt. & Pwr., pf.	104	....	....
Central Ark. Ry. & Lt., 7% pf.	98	....	....
Central Ill. Pub. Serv., 6% pf.	89	....	....
Central Ind. Pwr., 7% pf.	86	....	....
Central Pwr. & Lt., pf.	100	....	....
Central States Elec., 7% pf.	92	....	....
Central States Elec., com.	m200	200	230
Century Elec., com.	m117	110	117
Chicago Fuse Mfg., com., no par.	a 32	30	35
Cincinnati Gas & Elec., com.	g 92¼	88	95¼
Cities Service, 6% pf.	i 92¼	86¼	92¼
Cities Service, pf.B—10.	i 8¼	7¼	8¼
Cities Service, pf. BB—100.	i 82¼	74	82¼
Cities Service, com.—20.	i 49¼	37¼	49¼
Cities Service, Bks. Shrs.—10.	i 24¼	19¼	24¼
Clarion River Pwr., pf.	95	....	....
Cleveland Elec. Illg., 6% pf.	108	....	....
Cleveland Elec., Illg., com.	290	....	....
Colorado Pwr., 7% pf.	95	....	....
Columbia Gas & Elec., 7% pf.	117¼	111¼	117¼
Columbia Gas & E., com.—no par.	89¼	63¼	90
Columbia Ry., Gas & Elec., 6% pf.	90	....	....
Columbus Elec. & Pwr., 2d pf.	106¼	....	....
Columbus Elec. & Pwr., new com.	55	....	....
Columbus Ry., Pwr. & Lt., 1st pf.	98¼	....	....
Columbus Ry., Pwr. & Lt., pf. B.	93	....	....
Col. Ry., Pwr. & Lt., com.—no par.	75	....	....
Commonwealth Edison, com.	a136¼	135¼	145
Commonwealth Pwr., 6% pf.	92¼	82	92¼
Commonwealth Pwr., com—no par.	41¼	28¼	43¼
Conn. Lt. & Pwr., 8% pf.	119	....	....
Conn. Lt. & Pwr., 7% pf.	110	....	....
Cons. Gas of N. Y., pf.—50.	59¼	....	....
Cons. Gas of N.Y., com.—no par.	112¼	87	115¼
Cons. Gas Elec. Lt. & Pwr. of Balti., 6% pf.	c106¼	102	107¼
Cons. Gas, Elec. Lt. & Pwr. of Balti. 6½% pf.	e111¼	108¼	111¼
Cons. Gas, Elec. Lt. & Pwr. of Balti. 7% pf.	e113	109	113¼
Cons. Gas, Elec. Lt. & Pwr. of Balti. 8% pf.	e125	....	....
Cons. Gas, Elec. Lt. & Pwr. of Balti. com.—no par.	e 51¼	45	57¼
Cons. Pwr. & Lt., 7% pf.	105	....	....
Consumers Pwr., 6% pf.	99	....	....
Consumers Pwr., 6.6% pf.	104	....	....
Continental Gas & Elec., 7% ptc. pf	103	....	....
Continental Gas & Elec., 7% pr. pf.	97¼	....	....
Continental G.&E., com.—no par.	185	....	....
Crocker Wheeler, com.	24	....	....
Crocker Wheeler, pf.	62	....	....
DALLAS PWR. & LT., 7% pf.	108¼	....	....
Dayton Pwr. & Lt., 6% pf.	99¼	....	....
Detroit Edison, com.	134¼	123¼	141¼
Dubilier Condenser com.—no par.	5¼	3¼	11
Dubuque Elec., 6% pf.	94	93	98¼
Duquesne Lt., 7% pf.	114	....	....
EAST. N. Y. UTIL. pf.	101	....	....
Eastern New York Util., com.	65	....	....
Eastern States Power.	12	....	....
Eastern States Power, pf.	89	....	....
Eastern Tex. Elec., 7% pf.	102	....	....
East. Tex. Elec., com.—no par.	75	....	....
Edison Elec. Illum. of Boston, com.	d225	....	....
E. Paso Elec., com.—no par.	70	....	....
E. Paso Elec. pf.	104	....	....
Elec. Bond & Share, 6% pf.	k106	103¼	109¼
E. Bd. & Share Sec., com.—no par.	t 67	56¼	86
El. Household Util.	a 16	11¼	25
Elec. Investors, 6% pf.—no par.	92	....	....
Elec. Investors, com.—no par.	40¼	30¼	74¼
Elec. Investors, 10% pd. receipts.	25	....	....
Elec. Pwr. & Lt., ctfs. pf.	97	89¼	98¼
Elec. Pwr. & Lt., ctfs., 40% pd.	104	99¼	115
Elec. Pwr. & Lt., ctfs. full pd.	k102¼	102¼	110¼
Elec. Pwr. & Lt., ctfs., com—no par.	17¼	15¼	34¼
Elec. Refrig.	36¼	33¼	78¼
Elec. Ry. Securities, com.—no par.	5¼	4¼	10
Elec. Storage Battery, com.—no par.	83¼	71¼	94¼
Elmira Wtr., Lt. & R. R., 7% pf.	99	....	....
Emerson Elec., pf.	m101	100	104¼
Empire Dist. Elec., 6% pf.	t 90	82	90
Empire Power, A.	26¼	....	....
Engr. Pub. Serv., pf.—no par.	m 94	92¼	96¼
Engr. Pub. Serv., com.—no par.	22¼	19¼	24¼
Eureka Vac. Cleaner, com.—no par.	61	43	61
FAIRBANKS MORSE, pf.	£106¼	106¼	115
Fairbanks Morse, com.—no par.	46	40¼	59¼
Federal Lt. & Trac., com.	42¼	28	45¼
Federal Light & Traction, pf.	£ 89	86	91¼
Federal Utilities, pf.	m 70	....	....
Federal Utilities, com.	m 17	....	....
Ft. Worth Pwr. & Lt., 7% pf.	t 108¼	105	108¼
GALVESTON-HOUSTON ELEC., 6% pf.	60	....	....
Galveston-Hstn. El., com.	20	....	....
Gen. Elec., com.	88¼	79	95¼
Gen. Elec., special—10.	11¼	11	11¼
Gen. G.&E., (Del.) com. A no par.	44¼	34	59
Gen. G.&E., (Del.) com. B no par.	m 37¼	36	48¼
Gen. G.&E., (Del.) A pf. $8 no par.	m111	105¼	113
Gen. G.&E., (Del.) A pf. $7 no par.	99¼	95	99¼
Gen. G.&E., (Del.) pf. B.	96	92¼	96
General Public Service, pf.	m103	100	106
General Public Service, com.	£ 11	11	16¼
Ga. Lt., Pwr., & Rys., 6% pf.	92	....	....
Ga. Lt., Pwr. & Rys., com.	m 60	65	80
Ga. Ry. & Power, 8% pf.	114	....	....
Ga. Ry. & Power, 7% pf.	106	....	....
Ga. Ry. & Pwr., 4% pf.	116	....	....
Ga. Ry. & Pwr., com.	120	....	....
Gt. Western Pwr., 7% pf.	h103¼	....	....
IDAHO PWR., 7% pf.	103	....	....
Ill. No. Utilities, 6% pf.	88	88	92
Ill. Pwr. & Lt., 7% pf.	98¼	....	....
Ingersoll Rand	95	80¼	105
Int. Combus. Engr., com.—no par	42¼	33¼	64¼
Int. Utilities, class A—no par.	29	25	39
Int. Utilities, class B—no par.	£ 4	3¼	9¼
Interstate Pwr., pf., no par.	92	....	....
Interstate Pub. Serv., 7% pf.	97	....	....
Iowa Ry. & Lt., 7% pf.	95	....	....
JERSEY CENTRAL PWR. & LT., 7% pf.	96	....	....
Jersey Central Pwr. & Lt., ptc., pf.	108	....	....
Jersey Central Pwr. & Lt., com.—no par	25	....	....
Johns-Manville, com.—no par.	166	130	169

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh; jWashington. kBid, low, high. Saturday, Nov. 27. lBid, low, high, Wednesday, Dec. 1. mLatest quotations available.

Stock Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday Nov. 30	Low 1926	High 1926
KANSAS CITY PWR. & LT., pf.	114¼	107½	115
Kansas Gas & Elec., 7% pf.	*l*103½	99	103½
Kentucky Hydro-Elec., pf.	*a* 94½	91½	95½
Kentucky Sec., 6% pf.	82½	....	....
Kentucky Sec., com.	108	....	....
Kentucky Utilities, 6% pf.	82	....	....
Keystone Pwr. & Lt. 7% pf.	96½	....	....
LA CLEDE GAS LT., com.	177½	146	178
Lehigh Pwr. Sec., com.—no par	16	10	22
Long Island Ltg., 7% pf.	109	....	....
Long Island Ltg., com.—no par	130	....	....
Los Angeles Gas & Elec., 6% pf.	107	....	....
Louisville Gas & Elec., Class. A	24½	22½	26½
MANHATTAN ELEC. SUPPLY.	*k* 47	44	87½
Manila Elec., com.—no par	*k* 40	27½	45½
Maytag Mfg., com.	22	19	24½
Memphis Pwr. & Lt., pf., $7, no par	107	....	....
Metro. Edison, pf.—$6—no par	93	....	....
Metropolitan Edison, pf., $7, no par.	104	....	....
Metropolitan Edison, com., no par.	55	....	....
Middle West Utilities, 7% pf.	*n*105	97½	111½
Middle West Utilities, 7% pr. lien pf	*a*116½	106½	123½
Middle West Utilities, com.—no par.	*a*111	99	134½
Midland Utilities, pr. In. pf.	*a* 99	98	104
Midland Utilities pf. A	*m* 98	96	99½
Milwaukee Elec. Ry. & Lt., 7% pf.	101	....	....
Milwaukee Elec. Ry. & Lt., 6% pf.	97	....	....
Minn. Pwr. & Lt., 7% pf.	*l*104½	100	104½
Miss. Pwr. & Lt., pf.	105	....	....
Miss. River Pwr., 6% pf.	95	....	....
Miss. River Pwr., com.	*m* 60	....	....
Mohawk Hudson Pwr., 1st pf.—$7 no par	104½	....	....
Mohawk Hudson Pwr., 2nd pf.—$7—no par	100	....	....
Mohawk Hudson Pwr., com.—no par	23½	20½	28½
Montana Pwr., pf.	*m*117½	112½	119½
Montana Pwr., com.	*k* 82	69½	86½
Montreal Pwr., com.	*m* 72½	....	....
Mountain States Pwr. pf.	97	....	....
Mountain States Pwr., com.	18	....	....
NASSAU & SUFFLOK, LTG., pf.	98½	....	....
National Carbon, pf.	*a*125	124	128
National Electric Pwr-A.	22½	15½	26½
National Elec. Pwr., pf.	92	....	....
Nat. Lt., Ht. & Pwr., com.	24	....	....
National Lt., Ht. & Pwr., 5% pf.	70	....	....
National Pwr. & Lt., pf., $7—no par.	103	96	103
National Pwr. & Lt., com.—no par.	20½	16½	38½
National Pub. Serv., 7% pf.	89	....	....
National Pub. Serv., pte. pf.	107	....	....
National Pub. Serv., A com.—no par.	*m* 19½	15½	24
National Pub. Serv., B com.—no par.	*m* 14½	10	16½
Nebraska Pwr., 7% pf.	*l*107½	103	107½
Nevada-Calif., Elec., com.	*m* 20	18½	44½
New Brunswick Pwr., pf.	58	....	....
New England Pub. Serv., pr. In. pf.	99	....	....
New England Pub. Serv., pf.	94	....	....
N. J. Pwr. & Lt., 7% pf.	109½	....	....
New Orleans Pub. Serv., 7% pf.	103	....	....
N. Y. & Queens Elec. Lt. & Pwr., 5% pf.	88	....	....
N. Y. Central Elec., 7% pf.	98	....	....
Newport News & Hampton Ry., Gas & Elec., com.	109	....	....
Newport News & Hampton Ry., Gas & Elec., pf.	109	....	....
Niagara Falls Pwr., 7% pf.—25	28½	27½	29½
Niagara, Lock & Ont. Pwr., 7% pf.	109	....	....
No. Amer., 6% pf.—50	51½	49	52½
No. Amer., com.—10	48½	42	67
No. Amer. Edison pf.—no par	94½	91½	96½
No. Amer. Lt. & Pwr., pf.	101	88	104
No. American Utilities, pf., full pd.	*m* 94½	89	96
No. American Utilities, pf., 25% pd.	*m* 19	18	27
N C Pub. Serv., pf.—$7—no par.	93	....	....
Northeastern Pwr., com.	17½	15½	36½
No. Indiana Gas & Elec., pf. A.	102	98	103½
No. Indiana Public Service — pf.	*m*102	....	103½
No. N. Y. Utilities, 7% pf.	101	....	....
No. Ohio Pwr., com.—no par.	10½	10½	26½
No. Ohio Trac. & Lt., 6% pf.	81	....	....
No Ohio Trac. & Lt., 7% pf.	92	....	....
No. Ont. Lt. & Pwr., pf.	80	....	....
No. Ont. Lt. & Pwr., com.	73	....	....
No. States Pwr., 7% pf.	101	....	....
No. States Pwr. com.	106½	97	136½
No. Texas Elec., 6% pf.	50	....	....
No Texas Elec., com.	15	....	....
OHIO BRASS, com. B—no par.	76	70	80
Ohio Brass, pf.	100	98	101
Ohio Gas & Elec., 7% pf.	94	....	....
Ohio Pwr., 6% pf.	95½	....	....
Ohio Pub. Serv., 6% pf.	*l* 94½	90	96½
Ohio Pub. Serv., 7% pf.	*l*103½	96	104
Ohio River Edison, pf.	102	....	....
Oklahoma Gas & Elec., pf.	95	....	....
PACIFIC GAS & ELEC., 6% pf.	98½	98½	103
Pacific Gas & Elec. com.	129½	118	133½
Pacific Pwr. & Lt., 7% pf.	*l*102½	98	102½
Parr Shoals Pwr., 6% pf.	92	....	....
Penn Central Lt & Pwr., pf.—no par	*c* 73	70½	91
Penn-Ohio Edison, 7% pf.	95	....	....
Penn-Ohio Edison, 6% pf.	95	93	96
Penn-Ohio Pwr. & Lt., 7% pf.	98	....	....
Penn-Ohio Pwr., & Lt., 8% pf.	108	....	....
Penn Pwr. & Lt.—$7—no par.	*l*107½	103	108½
Penn Pub. Serv., 7% pf.	103	....	....
Penn Pub. Serv., 6% pf.	87	....	....
Penn Wtr. & Pwr., com.	*e*171½	141	171½
Phila. Co., 6% pf.—50	*c* 50½	48	50½
Phila. Co., com.—50	85	59½	89
Phila. Elec., com.—25	*c* 50½	41½	67½
Pittsburgh Utilities, pf.—10	*m* 19½	14½	20½
Portland Elec. Pwr., 7% pf.	98	....	....
Portland Elec. Pwr., 6% pf.	83	....	....
Portland Elec. Pwr., 6% 2nd pf.	70	....	....
Portland Elec. Pwr., com.	29	....	....
Potomac Elec. Pwr., pf.	*m*107½	....	....
Pwr. Corp. of N.Y., com—no par.	*m* 79	77½	90½
Pwr. Sec., pf.—no par.	24	....	....
Pwr. Sec., com.—no par.	6	....	....
Pub. Serv. of Colorado 7% pf.	*l* 99	96	100
Pub. Serv. of N. J., 7% pf.	109½	103½	110
Pub. Serv. of N. J., 8% pf.	*k*124	115	124½
Pub. Serv. of N. J., com.—no par.	33½	31½	33½
Pub. Serv. of No. Ill., 6% pf.	*a*102	99½	1 06
Public Serv. of No. Ill., 7% pf.	*a*113	112	116½
Pub. Serv. of No. Ill., com.—no par	*a*131½	121	140
Pub. Serv. of No. Ill., com.	*a*129½	128	143
Pub. Serv. of Okla., 7% pf.	98	....	....
Pub. Serv. Elec. & Gas, 6% pf.	103½	97	104½
Public Service Elec. Pwr., pf.	114	106	114
Puget Sound Pwr. & Lt., 7% pf.	103	....	....
Puget Sound Pwr. & Lt., 6% pf.	83	....	....
Puget Sound Pwr., & Lt., com.	29	26	66½
RADIO CORP. OF AM., pf.—50	*k* 52½	44½	53½
Radio Corp. of Amer., com.—no par.	56½	32	61½
Republic Ry. & Lt., pf.	120	....	....
Republic Ry. & Lt., com.	90	....	....
Rochester Gas & Elec., 5% pf.	95	....	....
Rochester Gas & Elec., 6% pf.	104	....	....
Rochester Gas & Elec., 7% pf.	104	105	107
SAN JOAQUIN LT. & PWR., 7% pf.	106	....	....
Safety Cable, com.	53½	42½	55½
St. Joseph Ry., Lt., Ht. & Pwr., pf.	67	....	....
Servel Corp.	11½	11	22½
Sierra Pacific Elec., com.	24	23	28½
Sioux City Gas & Elec., 7% pf.	99	....	....
S. E. Pwr. & Lt., pf.—$7—no par.	*k*102	....	....
Southeastern Pwr. & Lt., pte. pf.	*k* 68	....	....
S E. Pwr. & Lt., com.—no par.	32	20	46½
So. Calif. Edison, 8% pf.—25	32	....	....
So. Calif. Edison, 7% pf.—25	27½	....	....
So. Calif. Edison, 6% pf.—25	24½	24½	25½
So. Calif. Edison, com.	31½	30½	33
Southern Cities Utilities, 7% pf.	87	....	....
Southern Cities Utilities, com.	36½	28	49
Southwestern Lt. & Pwr., A.	60	....	....
Southwestern Lt. & Pwr., B.	60	....	....
Southwestern Lt. & Pwr., $6 pf.	82	....	....
Southwestern Pwr. & Lt., 7% pf.	102½	....	....
Springfield (Mo.) Ry & Lt., 7% pf.	97	....	....
Standard Gas & Elec., 8% pf.	56½	53½	57½
Standard Gas & Elec., 7% pf.	103	....	....
Standard Gas & Elec., com.—no par.	56	51	69
Standard Pwr. & Lt., 7% pf.	95	....	....
Staten Island Edison, pf.—$6—no par	95	....	....
Superhester, com.—no par.	161	....	....
Syracuse Lighting, 7% pf.	102	....	....
Syracuse Lighting, 8% pf.	115	....	....
Syracuse Lighting, com.	340	....	....
TAMPA ELEC., com.	46½	....	....
Tenn. Elec. Pwr., 6% pf.	90	....	....
Tenn. Elec. Pwr., 7% pf.	103	....	....
Terre Haute, Ind. & East Trac., pf.	20	....	....
Terre Haute, Ind. & East. Trac., com	1	....	....
Tex. Pwr. & Lt., 7% pf.	*l* 107½	102	107½
Tide Water Pwr., 8% pf.	105	....	....
Timken Roller Bearing, com—no par	79½	44½	85½
Toledo Edison, 8% pf.	*l*114	111	114
Toledo Edison, 7% pf.	*l*103	101	103
Toledo Edison, 6% pf.	*l* 94½	90	95
Toledo Edison, com.	100	....	....
Tri-City Ry. & Lt., 6% pf.	88	....	....
UNITED GAS & ELEC., 6% pf.	98	....	....
United Gas & Elec., com.—no par.	*m* 57	56	66
United Gas & Elec. (N.J.), 5% pf.	70	....	....
United Gas Impr.—50	*c* 92	84½	144½
United Lt. & Pwr. pf.—$4—no par.	49	....	....
United L. & P. pf.—$6.50—no par.	87½	....	....
United Lt. & Pwr., com., A—no par	13½	10½	28
United Lt. & Pwr., com., B—no par	17	....	....
Utah Pwr. & Lt., 7% pf.	*l* 103½	99	103½
Utica Gas & Elec., 7% pf.	104½	....	....
Utica Gas & Elec., com.	200	....	....
Utilities Pwr., & Lt., 7% pf.	92	....	....
Utilities Pwr. & Lt., com A	*m* 30½	26½	37
Utilities Pwr. & Lt., com. B—no par	16½	13½	18½
VERMONT HYDRO - ELEC., 7% pf.	95½	....	....
Virginia Elec. & Pwr., 7% pf.	104	....	....
Virginia Pwr., 7% pf.	108	....	....
Virginian Pwr., com.	70	....	....
WAGNER ELEC., pf.	*m* 70	67½	85
Wagner Elec., com.—no par.	*m* 19½	13½	34½
Washington Ry. & Elec., com.	175	....	....
Washington Ry. & Elec., pf.	89	....	....
Washington Wtr. Pwr., com.	132	....	....
West Mo. Pwr., 7% pf.	*m* 92	....	....
West Penn., 7% pf.	*m*113½	108	115
West Penn, com.	*m*125	118	130
West Penn Elec., pf.	*k* 99½	95½	101
West Penn Elec., Class A.	*k* 95	88½	98½
West Penn Pwr., 6% pf.	*k*113	108	115
West Va. Lt., Ht. & Pwr., 7% pf.	94½	....	....
West Va. Util ities 7% pf.—50	48½	....	....
Western Pwr., 7% pf.	98	91½	99
Western States Gas & Elec., 7% pf.	92	....	....
Western States Cas & Elec., com.	17	....	....
Westinghouse El. & Mfg., com—50.	69½	65	79½
Weston Elec. Instrument, Class. A.	*k* 32	27½	32½
Weston Elec. Instrument, com.	16½	13½	19½
Wheeling Elec., pf.	95	....	....
Wis. Pwr., Lt. & Ht., 7% pf.	95	....	....
Worthington Pump, pf. A.	*k* 44	44	80
Worthington Pump, pf. B.	40½	37½	65
Worthington Pump, com.	21	19	44½
YADKIN RIVER PWR., 7% pf.	*l*107½	102	107½
Yale & Towne, com.—25	*k* 70	60½	72½

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington. *k*Bid, low, high, Saturday, Nov. 27. *l*Bid, low, high, Wednesday, Dec. 1. *m*Latest quotations available.

largely wholesale business and without extensive transmission lines to over 80 per cent for companies having steam generation only. In this respect, therefore, the company is quite within limits. The company's revenue at the end of last year was approximately one-fifth of total assets. Net earnings available for interest at the end of September last year amounted to $2,132,698 as against $1,898,576 a year ago. The annual interest on the entire funded debt of the company amounts to $823,720, so that interest is being earned approximately two and a half times. Net earnings, moreover, have shown a steady substantial increase during the past five years, and the number of times interest is earned has increased each year. Comparison of earnings of this company with those of the entire industry shows that the growth compares favorably with that of the industry as a whole. The amount earned last year on each preferred share was $19.75 against $13.25 the year before. The four-year average income on preferred was $393,714 against dividend requirements of $167,234. Dividends have been paid regularly on preferred stock.

The power and light franchises for the most part are without limit of time and extend well beyond the maturity of the outstanding bonds. The general requirement is that they should extend for a three-year period after bond maturity. The funded debt bears rather too high a proportion in relation to the book value of fixed properties, being 75 per cent rather than 60, which is usually considered favorable. The mortgage, of the modern type, is open, allowing for the issue of additional bonds when funds are required. Provision is made that "additional bonds may be issued par for par for refunding of underlying and divisional bonds, for not exceeding 80 per cent of the cost or fair value, whichever is less, of permanent improvements, additions and extensions to the properties of, or of new properties acquired by, the company and its subsidiaries."

With regard to the business progress of the company, the total energy sold last year amounted to 165,947,915 kw.-hr., which has more than doubled in six years. There were 35,843 customers last year, so that the volume sold per customer amounted to 4,629 kw.-hr.

New Capital Issues

Three new electric light and power public utility issues marked the opening of December. The Binghamton Light, Heat & Power Company made an offering of first refunding mortgage 5 per cent gold bonds, priced at 100 and interest, a piece of financing involving a total of $1,450,000.

General mortgage 5 per cent gold bonds of the Otter Tail Power Company were issued at 98½ and accrued interest to yield about 5.12 per cent, the total being $1,300,000.

To raise funds for the acquisition of additional property and for general corporate purposes the Electric Public Service Company made an offering of ten-year 6 per cent sinking-fund gold debenture bonds to the amount of $850,000. These bonds were priced at 95 and interest to yield over 6.68 per cent.

An additional issue of Central Public Service Company, series A, collateral trust gold bonds, amounting to $750,000, was offered at 97 and accrued interest to yield over 6.30 per cent.

Company Reports

Name of Company	Gross Earnings for October 1926	Gross Earnings for October 1925
Alabama Power	$1,320,167	$1,181,914
Carolina Power & Light	724,725	658,118
Central Illinois Light	357,089	336,107
Central Maine Power	441,791	415,253
Electric Power & Light	4,324,489	4,011,281
Illinois Power	210,550	217,692
Kansas City Power & Light	917,679	883,182
Massachusetts Lighting	365,587	329,219
New Bedford Gas & Edison Lt.	355,993	343,110
Northern Ohio Power	1,022,513	965,603
Ohio Edison	156,943	129,132
Penn-Ohio System	1,118,848	970,512
Philadelphia Company	5,037,526	5,093,320
Portland Electric Power	992,710	910,436
Public Service Corp. of N. J.	9,413,829	8,483,549
Puget Sound Light & Power	1,138,512	1,099,779
Southern California Edison	2,309,919	2,135,496
Southern Canada Power	123,936	111,041
Wasnington Water Power	509,975	527,093

Indiana Utility Increases Capital.—Articles have been filed with the Secretary of State of Indiana by the Indiana Hydro-Electric Company showing an increase in capital stock from $5,500,000 to $5,650,000, all of the increase being preferred stock.

Ottawa Company Shows Progress.—The Ottawa Light, Heat & Power Company, Ltd., which is one of the few remaining privately owned public utilities in Ontario, is making excellent progress, according to the annual report. Gross earnings of the company reveal a steady annual expansion during the eight years from 1918 to 1925, having increased from $1,114,915 for the year 1918 to $1,787,183 for the last year. This company was incorporated in 1906 and acquired the entire capital stock of the Ottawa Electric Company and the Ottawa Gas Company. The Ottawa Electric Company, which distributes electrical energy in the city of Ottawa, including the Dominion government offices and the properties of the Canadian National Railways, has only negligible competition from a municipality-owned distribution system which owns no generating station but purchases its power at wholesale.

Central Stations Raise $120,000,000 in November

New public offerings of securities by the electric light and power companies of the country during the month of November aggregated $120,865,000, the highest monthly total recorded since June. This figure compares with $61,243,500 for the month of October and with $66,451,500 for November, 1925. Since January the central stations have raised $1,076,214,982, exclusive of local sales to customers and employees, as against $904,726,010 for the eleven-month period of 1925. The totals for 1925, incidentally, include Canadian issues, while those for the current year represent domestic issues only.

Twenty-three companies participated in the new financing during November, when several sizable loans were floated. The largest individual offering was made by the Arkansas Power & Light Company in the form of first and refunding mortgage gold bonds, amounting to $18,000,000. Long-term financing again predominated, though several short-term issues appeared. The average yield was 5.32 per cent. Attention is called to the prominence of refunding operations.

Security Issues of Electric Service Companies in November

Name of Company	Amount of Issue	Period Years	Class	Purpose	Interest Rate	Price	Per Cent Yield
Peoples Light & Power Corp	$1,000,000	1–2	Convertible serial gold notes	To finance acquisition of properties	5½	99.28 and 98.65	5.95
Long Island Lighting Co	2,000,000	29	First refunding mortgage gold bonds, series B	Additions, extensions and improvements	5	99½	5.03
Public Service Electric & Gas Co	15,000,000	..	Cumulative preferred stock	To reimburse for expenditures and additions to the property made and to be made	6	102½	5.87
Texas Power Corp	400,000	30	General mortgage gold bonds	Construction	6½	99½	6.55
Northern Indiana Public Service Co.	11,500,000	40	First and refunding mortgage gold bonds, series C	To retire securities, to reimburse for capital expenditures and to provide for expansion	5	98½	5.08
Public Service Company of Northern Illinois	10,000,000	5	Debentures	Additions and extensions	5	99⅔	5.10
Western Power Corp	10,000,000	30	Convertible collateral trust gold bonds, series A	To redeem debentures and for additional investment in stocks of subsidiaries	5½	99	5.55
Public Service Co. of New Hampshire	3,150,000	30	First and refunding mortgage gold bonds, series A	To retire bonds of constituent companies, for extensions and for other corporate purposes	5	99	5.06
Potomac Edison Co	11,250,000	30	First mortgage gold bonds, series E	Retirement of bonds and for other corporate purposes	5	97	5.19
Houston Lighting & Power Co	2,000,000	27	First lien and refunding mortgage gold bonds, series A	To reimburse for expenditures for extensions to provide funds for construction and for other corporate purposes	5	99½	5.03
McGraw Electric Co	1,400,000	3	Secured gold notes	To finance acquisition of new companies to provide additional working capital and for other corporate purposes	6½	100	6.50
Railway & Light Securities Co	1,000,000	25	Collateral trust sinking fund bonds		5	96½	5.25
Texas Power & Light Co	16,000,000	30	First and refunding mortgage gold bonds	Additions and for other corporate purposes	5	97	5.20
Electric Public Service Co	1,000,000	15	Secured gold bonds, series B	To provide funds for the acquisition of additional property and for other corporate purposes	6	98	6.20
	500,000	..	Cumulative preferred stock	To provide funds for the acquisition of additional property and for other corporate purposes	7	96½	7.25
Central Illinois Public Service Co.	2,425,000	30	First mortgage and refunding gold bonds, series E	To reimburse for additions, extensions and improvements to its property	5	97	5.20
Lake Superior District Power Co	3,500,000	30	First mortgage and refunding gold bonds, series B	Redemption of bonds, reimbursing for expenditures on additions and for other corporate purposes	5	98	5.13
Mountain States Power Co	750,000	12	First mortgage gold bonds, series B	To reimburse for extensions and additions.	6	102½	5.70
Arkansas Power & Light Co	18,000,000	30	First and refunding mortgage gold bonds	To retire debt of constituent companies	5	95¼	5.27
Consolidated Gas, Electric Light & Power Co. of Baltimore	7,000,000	39	First refunding mortgage sinking fund gold bonds, series F	To retire securities	5	101½	4.90
Wisconsin Power & Light Co	1,000,000	30	First lien and refunding mortgage gold bonds, series E		5	96½	5.20
Colorado Central Power Co	850,000	20	First mortgage sinking fund gold bonds, series A	To finance acquisition of properties and for general corporate purposes	5½	96	5.83
Cape & Vineyard Electric Co	550,000	..	Cumulative preferred stock	To reduce indebtedness	6	99	6.06
Southern Wisconsin Electric Co	590,000	30	First mortgage gold bonds, series A	To redeem bonds, to reimburse treasury and other corporate purposes	5	98	5.13
Total	$120,865,000						

Manufacturing and Markets

Motor Resale Agreement

Contractor-Dealers Submit Agreement to Board of Trade—Committee to Study Data and Report to Board

AT A MEETING of the board of governors of the Electrical Board of Trade of New York held on Nov. 18 the electrical contractor group presented a motor resale agreement which it was desired to discuss with the motor manufacturers. The chairman appointed a committee consisting of two representatives each from the manufacturers, jobbers, engineers and utilities groups to study the data, confer with the contractors' committee and make a report to the board. The following committee was appointed: For the manufacturers, F. S. Hartman, General Electric Company, and C. E. Stephens, Westinghouse Electric & Manufacturing Company; for the jobbers, W. J. Drury, Graybar Electric Company, and W. A. Kennedy, Sibley-Pitman Electric Corporation; for the engineers, F. A. Pattison, Pattison Brothers, and Chris Kaiser, Kaiser, Muller & Davis, and for the utility companies, Joseph F. Becker, United Electric Light & Power Company, and Clarence Law, New York Edison Company. The members of the contractors' committee are: M. L. Pomares, chairman; Thomas H. Cooper, J. L. Kruger, L. C. MacNutt, Louis Kalischer, Louis I. Waldman, John Hooley, C. F. Goodwin, John Flagg and Louis Freund.

The motor resale agreement submitted by the contractors' group is as follows:

Motor sales to contractor-dealers for resale are to be governed by the following conditions:

Contracts. — Contractor-dealers may obtain a motor sales agreement from one manufacturer. Only in cases where a special type of apparatus is manufactured by another manufacturer may he obtain another motor sales contract for the special apparatus.

Motor Purchases.—Purchases under the above contract with the manufacturer, it is recommended, shall be on the following terms: 10 per cent to contractor-dealers not holding motor sales agreements; 15 per cent to contractor-dealers holding a motor sales agreement. The question of cash discount not exceeding 2 per cent ten days to be applied to both.

Contractor-Dealers' Selling Policy.—Contractor-dealers holding a motor sales agreement are to make every effort to sell the product of the manufacturer with whom they hold the contract.

Agreements to Cover.—Alternating-current and direct-current motor equipment of the company's manufacture, up to and including 200 hp. each: (a) On sales of motors above 200 hp. each by the contractor-dealer holding a motor agency agreement he is to have a differential of at least 5 per cent; (b) on sales of motors above 200 hp. each by the contractor-dealer not an agent of the motor manufacturer he is to receive a differential of 2½ per cent; (c) on motors under 1 hp. it is recommended that the discount be 25 per cent to contractor-dealers holding a motor sales agreement and 15 per cent to the contractor-dealer not holding a motor sales agreement.

Manufacturers' Selling Policy.—Manufacturers' policy will be to sell to customers direct at retail prices, except: (a) Manufacturers who buy motor apparatus in connection with their own apparatus for resale purposes; (b) public utilities (electrical), on the same terms and conditions as contractor-dealers holding a motor sales agreement; (c) sales to federal government do not come under this agreement; (d) eliminate all future delivery contracts, syndicate order contracts, etc.

Direct Sales.—Where motor apparatus is sold direct to the customer, compensation of at least 5 per cent shall be allocated to the contractor-dealer (with any motor sales agreement) installing the wiring for this apparatus.

A contractor-dealer is defined as one holding a master electrician's license.

Orders for Electrical Goods

Orders booked during the third quarter of 1926, as reported to the Department of Commerce by ten of the principal manufacturers of electrical goods, were $184,106,760, as compared with $189,641,941 for the second quarter of 1926 and $180,761,007 for the third quarter of 1925. The accompanying table gives the revised totals of bookings for each quarter since the beginning of 1922. They are not a complete statement of the industry but are probably sufficiently representative to indicate the trend.

	1922	1923	1924	1925	1926
First quarter	$115,793,257	$178,739,186	$178,620,061	$183,567,879	$203,882,865
Second quarter	130,012,516	193,290,931	177,148,514	176,339,363	189,641,941
Third quarter	135,686,958	161,464,344	146,473,892	180,761,007	184,106,760
Fourth quarter	152,960,323	170,566,740	183,140,421	183,362,538	.....
Total	$532,453,054	$704,061,201	$685,382,888	$724,030,787	.....

Sales Statistics on Direct-Current Motors

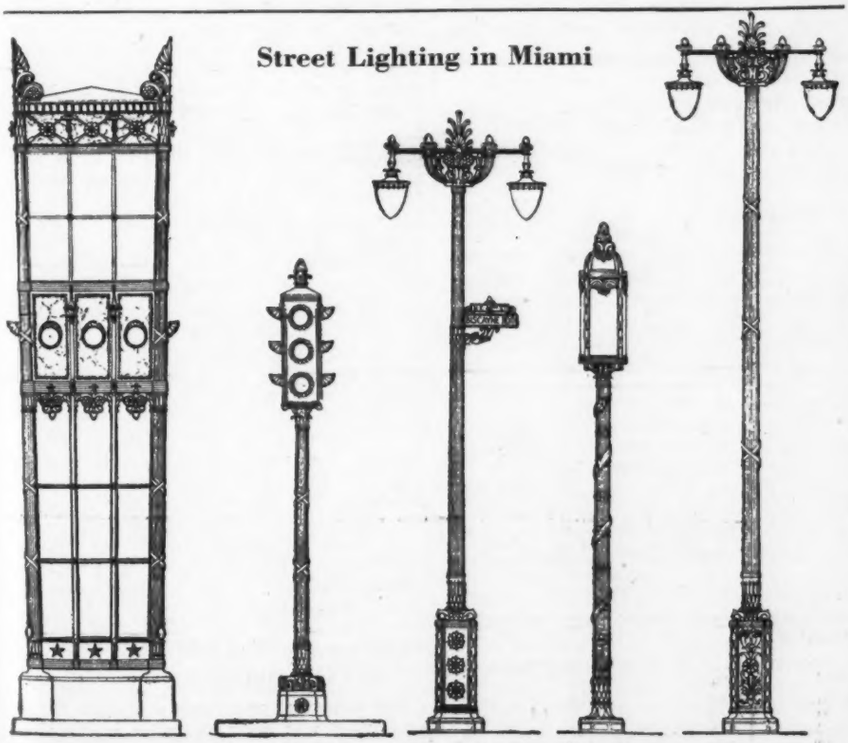
Orders entered for direct-current motors during the month of September were larger than those entered for any month this year with the exception of March. The suggestion has been made that these statistics would be more valuable if the total number of units

ORDERS ENTERED AND SALES BILLED FOR DIRECT-CURRENT MOTORS

(1-hp. to 200-hp. inclusive, built in general-purpose motor frames, including control equipment sold with motors and excluding spare parts.)
(Issued by National Electrical Manufacturers' Association—Apparatus Division)

Month, 1926	Orders Entered	Billings
January	$815,976.75	$934,124.01
February	878,028.36	807,281.31
March	1,167,748.91	1,027,318.84
April	866,858.52	821,946.62
May	740,231.54	793,832.28
June	904,269.40	928,272.41
July	740,424.22	876,257.25
August	792,613.03	876,296.67
September	937,913.01	745,782.97
Year to date	$7,844,063.74	$7,811,112.36

Street Lighting in Miami

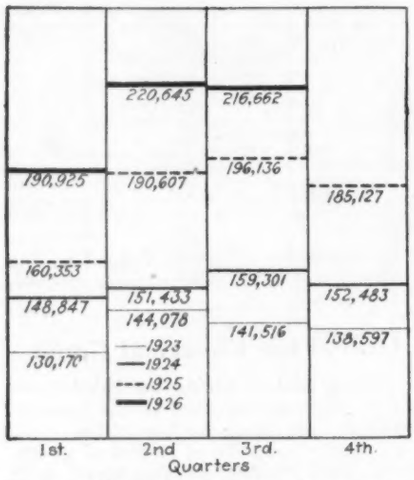


A national competition was held to select designs for traffic control and street lighting equipment. The designer of the above illustrations won first prize.

Sales of Washing Machines by Quarters 1923-1926 (Except Electrics)

Electric Washing Machine Sales Shown Separately
(Data Supplied by American Washing Machine Manufacturers' Association)

Quarter	Hand-Power Machines 1923	1924	1925	1926	Gas and Power Machines 1923	1924	1925	1926	Water-Power Machines 1923	1924	1925	1926	Total Including Electric 1923	1924	1925	1926
First	35,317	22,079	25,174	26,854	5,934	3,803	6,762	13,742	7,352	4,732	5,475	7,228	179,058	179,461	197,764	238,749
Second	30,811	20,470	25,314	24,516	6,319	4,310	9,034	19,103	7,758	4,023	5,844	8,226	188,176	180,227	230,799	272,490
Third	30,212	19,036	22,348	20,293	4,289	3,987	10,431	9,039	6,947	5,078	5,665	8,518	172,964	187,402	234,580	254,512
Fourth	19,063	20,748	20,922	.....	3,568	4,842	9,518	.....	6,498	3,729	3,789	.....	167,726	181,802	219,356	.....
Total	105,403	82,333	93,758	.....	20,110	16,933	35,745	.....	28,555	17,562	20,773	.....	707,924	728,892	882,499	.....



SALES OF ELECTRIC WASHING MACHINES BY QUARTERS, 1923-1926

Note.—During the month of September sales of electric washing machines amounted to 76,308 and established a new monthly sales record in the history of the washing machine industry.

and aggregate horsepower were also included. A comparison could then be made from year to year regardless of price changes. It is probable that these further data will be included in the near future.

Copper Association to Push Housewiring Development

General inadequacy of electric wiring in the great majority of American homes at the present time represents a situation which is interesting not only to public utilities, electrical manufacturers and contractors, but to the copper industry as well. The promotion of countrywide improvement in housewiring installations as a means for increasing the market for copper in the form of wire has attracted the attention of the Copper and Brass Research Association, 25 Broadway, New York City, which is now planning an advertising and publicity campaign addressed to the home owner. This campaign will stress the importance of modernizing house-wiring installations from the standpoint of convenience and better lighting. It will be conducted in similar manner to others which the Copper and Brass Research Association has been carrying on in the general building field, as, for example, the campaigns on brass pipe, copper leaders and gutters and copper and bronze screen cloth.

Business Conditions

MANUFACTURERS express a decidedly optimistic attitude toward business conditions in the industry. No spectacular orders have been placed and power company buying is not very active. Despite the fact also that industrial buyers showed a tendency to hold off buying during November, several manufacturers state that their sales for this year will show a material increase. Another company is looking forward to a regular increase in business next year. Oil-burner manufacturers are becoming more active buyers of motor equipment, and industrial heating equipment is steadily gaining in interest, especially in the southern New England metal centers. Jobbers' trade is heavy virtually throughout the country, and their sales indicate heavy holiday buying. The General Electric Company, as reported on page 1198 of this issue, has announced a reduction in motor prices.

In New England merchandising sales are active and many negotiations for industrial equipment are under way. A number of active projects involve an expenditure of more than $2,000,000 for heavy equipment. Many central station inquiries are being received in the New York district, although present buying is dull. Transformer equipment is especially active, and jobbers' lines are moving briskly. In the Southeast satisfactory sales are recorded, with ranges and small appliances selling in good volume. A contract for a textile-mill electrification involved $35,000 worth of motors and equipment, and central-station orders covered a good quantity of line-construction material. In St. Louis building construction materials are in especially good demand, and activity continues in the Illinois coal fields. Indications point to continued good business in the Middle West. Among the interesting orders placed was one for $125,000 worth of circuit breakers. On the Pacific Coast December sales show a marked improvement over those of early November. Railroad buying has improved and power company orders cover a large amount of stock material.

Delinquent Electrical Accounts

(Data Supplied by National Electrical Credit Association)

NUMBER OF ACCOUNTS REPORTED

Division	October 1925	October 1926	Per Cent Increase or Decrease	Ten Months 1925	Ten Months 1926	Per Cent Increase or Decrease
New York	311	242	—22.1	3,625	3,593	—88
Middle and Southern Atlantic States	279	188	—32.61	2,357	1,901	—19.34
New England	61	103	+68.8	849	1,203	+41.6
Pacific Coast	19	5	—73.6	185	230	+24.3
Central	927	673	—27.4	8,899	8,635	—2.96
Total	1,597	1,211	—24.2	15,915	15,562	—2.22

TOTAL AMOUNTS REPORTED

Division	October 1925	October 1926	Per Cent Increase or Decrease	Ten Months 1925	Ten Months 1926	Per Cent Increase or Decrease
New York	$39,307	$34,440	—12.3	$514,348	$527,619	+2.58
Middle and Southern Atlantic States	22,024	21,465	—02.54	310,414	221,579	—23.61
New England	3,965	7,123	+79.6	91,562	84,662	—7.5
Pacific Coast	1,524	673	—55.8	26,259	34,975	+33
Central	117,235	80,757	—31.1	1,074,559	960,258	—10.6
Total	$184,055	$144,458	—21.5	$2,017,142	$1,229,093	—9.32

AVERAGE AMOUNTS

Division	October 1925	October 1926	Ten Months 1925	Ten Months 1926
New York	$126	$142	$142	$147
Middle and Southern Atlantic States	79	114	132	116
New England	65	69	107	70
Pacific Coast	80	134	141	152
Central	126	119	120	111

Non-Ferrous Metal Market Dull—Sales Disappointing

For months the copper and zinc markets have not been so quiet as in the last week. The volume of buying has been disappointing, even taking the Thanksgiving holiday into considera-

NEW YORK METAL MARKET PRICES

	Nov. 24, 1926 Cents per Pound	Dec. 1, 1926 Cents per Pound
Copper electrolytic	13.70	13.55
Lead, Am. S. & R. price	8	7.90–8
Antimony	13½	13½
Nickel, ingot	35	35
Zinc spots	7.50–7.55	7.45
Tin, Straits	71½	71¼
Aluminum, 99 per cent.	27	27

Base copper price Dec. 1, 1926, 15¾ cents.

tion. Prices of copper, zinc and silver are all lower than a week ago. Lead prices seem to be stabilized for the time being at the current levels, but the week's business has been smaller than usual. Tin holds its own, owing to a continued scarcity of supplies, and the minor metals are substantially unchanged. The sole interest in copper on Wednesday seemed to be in the Western Union order for 1,750 tons, a part of which was for delivery in December, for which there was keen competition. Some bids are known to have been made as low as 13.55 cents, delivered. Foreign business has been excellent since the export association cut its price to 13.95 cents, c.i.f. Hamburg and Havre, on Tuesday. The former level was 14.125 cents.

While buying of lead in the domestic markets has been in only fair volume, the situation may be described as quiet rather than as weak. Until Wednesday prices have been remarkably steady at the same levels that have prevailed for several weeks. The American Smelting & Refining Company has maintained its official contract price at 8 cents. Large buyers seem to be more inclined to commit themselves at present prices than the smaller concerns.

Merchandising Sales Feature New England Market

Negotiations for industrial equipment and prime movers rather than actual sales continue to mark activity in the New England district. Plans for an important substation in Boston are rapidly maturing, and throughout the district a number of active projects involve the purchase of more than $2,000,000 worth of heavy equipment during the first quarter of 1927. Small-motor sales are steady, with manufacturers of oil-burning equipment becoming more active buyers. Generally fractional-horsepower sizes are in strong demand, and one manufacturer reports several large orders placed during the week, one for 200 and another for 120 machines. Small switch and control equipment sales are progressing and orders are being received in good volume.

Interest in industrial electric heating is gaining, and a number of good orders are expected to be placed soon. Activity in the southern New England metal centers is marked, and several plant additions are under consideration. Electric lighting is making good strides, reflector sales are heavy, and wire, cable and hardware orders are steady. A group of central-station companies reports the sale during the past week of more than 20,000 60-watt lamps. Seasonal trade is reported by jobbers as heavy. Household appliances are moving well, and stocks held are in excess of those of last year, with every indication that this season's trade will consume them. A group of central-station companies shows a gradually mounting increase in weekly sales, with the record of last week about 32 per cent above that for the corresponding week last year. The prospect of selling electrical merchandise this year is particularly bright, industrial and trade conditions being steady and construction continuing to offer inviting prospects to labor.

Improved Sales on Pacific Coast—Large Wire Order Placed

December sales on the Pacific Coast show a marked improvement over those of early November. Railroad buying, which has been slow since August, is much better. Power-company business is also featured by heavy stock buying such as an order for two carloads of assorted steps, braces and clamps totaling about $10,000, several fair-sized purchases of cross-arms and a good quantity of storm replacement material. A large inquiry received from a power company covered 5,000 ft. of 500,000-circ. mil., 15,000-volt, sector-type, paper-insulated, lead-covered triplex cable. Dealers' orders are at a high tide and indicate the holiday optimism. Contractors' orders are better, though still affected by maximum quantity reductions. Other machinery orders of interest include twelve 100-kw. subway-type transformers amounting to $9,000, a switchboard costing about $7,500 for a Hawaiian sugar company and 25 oil-well motors ranging from 15 hp. to 25 hp.

An order for more than 500,000 lb. of wire for use in railroad electrification work over the Cascade Mountains was placed last week. In Seattle and Puget Sound centers sales of motors and heavier apparatus were reported as light. Orders for appliances are fair. Some inquiries have been made by lumber mills for quotations on their repair and replacement requirements. Considerable activity is noted in ornamental street lighting in Seattle, Tacoma, Everett and certain smaller Sound cities, and a power company is now engaged in making minor extensions for service in rural districts. A pulp and paper mill in Oregon is expected to purchase, early in January, apparatus for an additional plant unit.

Building Construction Materials Active in St. Louis District

The notable feature in the business of the St. Louis district has been the activity in several jobbing lines, mainly in building construction materials. Sales of conduit, loom and safety switches are reported to be the largest for the current year, while armored cable, outlet boxes, lamp cord, panelboards, lighting fixtures, portable lamps, ranges and pole-line material have been moving splendidly. Commercial lighting equipment and weatherproof wire are selling somewhat slowly. Activity in the Illinois coal fields continues. The usual sales of medium-sized motors and switches were made, the only large order being for a 200-kw. motor-generator set for one of the mines in the Harrisburg (Ill.) group. One of the St. Louis power companies placed an order for 15,000 kva. of transformers and accessories, amounting to a total of about $150,000.

Many Central-Station Inquiries Received in New York District

Central station buying in the New York district is generally dull, although an increase in interest in some lines is evidenced by the number of inquiries for quotations which are being received. Transformers lead in this respect, and at least one substantial order is expected to be placed during the coming week. Poles and cross-arms are in fair demand for general maintenance work, but individual orders are small. The activity in the switching equipment field shows a decrease during the past few days both in sales and inquiries. Sales of line hardware, insulators, circuit breakers, etc., are quiet. In the industrial field the demand for motors of smaller sizes is fair, but is showing a falling off from the previous high level. Motors above 25 hp. are in less demand, as is also control equipment. Jobbers' lines are moving briskly, appliances particularly being in good demand.

Indications Point to Continued Good Business in Middle West

Indications in the Middle West point to continued good business. Apparently agricultural implement manufacturers have prospered as indicated by dividend notices declared this week. Industrial activity remains strong with an increasing trend as the holiday season approaches. Building activity continues favorable despite cold weather. Several large projects are being started. These include the rebuilding of the Hawthorne cable plant of the Western Electric Company, which calls for an expenditure of $2,500,000, and a ten-million-dollar theater and office building in Chicago. A second model home is under construction in Elmhurst, a Chicago suburb, and is intended to stimulate correct building construction. The various utility companies are busy with construction work while maintenance purchases are particularly large. Among the interesting orders placed this week was one for circuit breakers valued at $125,000. Jobbers' sales are steadily increasing as the holiday season approaches. Appliances are moving rapidly, particularly the smaller units.

Satisfactory Sales Recorded in Southeast—Appliances Active

Satisfactory business is reported by electrical interests in the Southeast. A contract for a textile-mill electrification in Tennessee has been closed, and orders were placed for $35,000 worth of motors and equipment and $30,000 worth of construction work. Industrial construction materials are in active demand throughout the territory, and small orders in very satisfactory volume were received from textile companies in Georgia. Ranges and small appliances are also selling in good volume, these lines being stimulated by

holiday campaigns. A general increase of about 20 per cent is to be noted in the sale of these commodities, despite the slowing up of activities in the rural sections on account of the cotton situation. A large central-station company which operates in quite a number of small towns is entering the merchandising field, and the first of its retail stores is scheduled to open during the first week in December. Orders for initial stocks were placed last week. An interesting feature of the electrical appliance line is the increasing popularity of electric water heaters, and satisfactory business is reported for the territory in general and for Florida in particular. One of the largest power companies in this section is planning an intensive sales campaign on these heaters during January.

Central-station purchases for stock are in good volume, one company placing orders last week for $15,000 worth of weatherproof wire and distribution transformers totaling $4,000. Line-construction activities continue to result in good orders for these materials, the most notable sales being for $8,000 worth of aluminum conductor, $2,000 worth of poles and pole-line hardware for one line and 119 miles of No. 2 aluminum conductor for several short lines. Other interesting central-station purchases included an order for a small electric truck, three 2,000-kva. transformers and oil-circuit-breaker equipment amounting to $37,000.

Activities of the Trade

Lighting Equipment Dealers to Hold Convention in Cleveland

At a meeting of the board of directors of the National Association of Lighting Equipment Dealers which was held at the headquarters office, 522 Fifth Avenue, New York City, early in November, it was decided that the next annual convention of the association should take place in Cleveland, at the Hollenden Hotel, Jan. 31 to Feb. 5, 1927. Some of the subjects to be discussed at the round-table conferences are the following: Window and show room display, new methods of lighting-fixture merchandising, correct method to use in figuring the cost and profit of a job, relationship of the dealer and the architect, shaded light, the manufacturer's relation to the dealer and the dealer's relation to the manufacturer, and methods employed to eliminate waste in business and increase net profits. The lighting equipment exhibition of the Artistic Lighting Equipment Association will take place in Cleveland at the Hollenden Hotel during the same week as the dealers' annual convention.

Century Electric Company to Pay Cash and Stock Dividends

At a meeting of the board of directors of the Century Electric Company, St. Louis held on Nov. 18 a cash and stock dividend was unanimously approved. A quarterly dividend of 1¾ per cent in cash will be paid on Jan. 1 to holders of preferred stock of record on Dec. 15, and also a quarterly dividend of 1¼ per cent in cash will be paid on Dec. 22 to holders of common stock of record on Dec. 15. On Dec. 22 common stock holders of record on Dec. 15 will also receive a stock dividend of 10 per cent in common stock of the company except that no certificates for fractional shares will be issued. In the case of fractional shares the treasurer has been authorized to issue scrip which may be consolidated into full shares prior to Feb. 28, 1927, either by surrender of fractional accruals totaling a full share or by purchase from the company of the necessary fraction to make a full share, for which purpose the price of the stock will be $120 per share. This dividend shall also be paid to employee subscribers of stock on the 1923 and 1926 installment plan of payment.

Westinghouse Company Enlarges Mansfield Plant

The sixth floor is now being added to the present general office building at the Mansfield plant of the Westinghouse Electric & Manufacturing Company at the corner of Fifth Street and the Pennsylvania Railroad and will be ready for occupancy on Jan. 1. This addition will add 8,000 sq.ft. of floor space for executives, a stenographic department and clerical, sales and engineering personnel. The one-story section, also now being constructed, will be devoted to twelve private executive offices and a general office capable of accommodating 50 workers with a separate division for stenographic help.

These increased building operations have been occasioned by the centralization at the Mansfield plant of both the production and sales force for all the electrical equipment manufactured. The company reports that the new four-story warehouse on Wayne Street is also progressing and when completed will be used for the storage of material and manufactured goods and eventually provide space for an increase of manufacturing area. This building, with an area of 140,000 sq.ft., will be ready for occupancy about March 1 of next year.

Fifth Power Show to Contain Over 500 Exhibits

The fifth National Exposition of Power and Mechanical Engineering, to be held at the Grand Central Palace, New York, during the week of Dec. 6 to 11, will contain more than 500 exhibits and occupy over 160,000 sq.ft. on four floors of the Palace and will be open from noon until 10 p.m. each day during that week. The Power Show, which will contain many interesting exhibits and which will later be described in the ELECTRICAL WORLD, has as one of its features a motion-picture program which is said to contain several distinctive novelties and to cover a broad field of engineering and industry. The diversity and interest of exhibits are shown in displays which will cover the generation and use of heat and power, heating, ventilation and refrigeration, instruments, power-transmission apparatus, machine-shop equipment, welding apparatus, woodworking machinery and special safety devices.

American Brown Boveri Reports Net Profit for Nine Months

The American Brown Boveri Electric Corporation and its subsidiaries report a net profit of $1,468,898 for the nine months ended Sept. 30, after deducting interest and depreciation but before allowing for federal taxes. For the September quarter the profit was $492,680, before deducting federal taxes, against $539,890 in the preceding quarter. The corporation has outstanding $3,000,000 of 7 per cent preferred stock, 392,556 shares of no par participating stock and 300,000 shares of no par founders stock.

Bell Lumber Company Increases Production Facilities

A new storage yard and switching facilities at Enderby, B. C., Canada, in connection with a mill that is being built at that point, have been completed by the Bell Lumber Company, Minneapolis. M. J. Bell, president of the company, has just returned from a two-months visit to his operations on Sugar Lake and the Shuswap River, where he personally supervised the work. Arrangements are also being made to put in new camps in connection with the timber operations on Sugar Lake. The company purchased a large tract of pole timber on Sugar Lake during the summer of 1925 and started operations on this site a few months later. The company states that in acquiring this body of timber it has an assured supply of fine poles which will take care of its trade for the next ten or fifteen years.

General Electric Company Reduces Motor Prices

A reduction in prices on its general-purpose motors, amounting to 5 per cent on most lines and 10 per cent on commonly used sizes of squirrel-cage induction motors, has been announced by the General Electric Company as effective since Dec. 1. The motors affected by the new price levels include both alternating-current and direct-current constant and variable-speed general-purpose motors, from 1 hp. to 200 hp. Prices of standard squirrel-cage induction motors have now been brought to a level within about 10 per cent of that in 1914.

Coincident with this reduction in prices the company has announced a unified schedule of discounts for different classes of purchasers. The discount for quantity purchased at one time, on one firm order, has been made uniform on a sliding schedule for all classes of buyers. The company states that these reductions have been made possible by improved manufacturing processes and quantity production.

The company has also announced that prices on its railway motors and car equipment have been reduced approximately 5 per cent, effective since Dec. 1. The company states that this reduction is the result of greater economies due to a consolidation of all railway manufacturing and engineering at the Erie, (Pa.) plant of the organization.

The F. W. Wakefield Brass Company, Vermilion, Ohio, announces a new "Red Spot" semi-indirect lighting unit specifically designed for the lighting of business offices.

The Robbins & Myers Company, Springfield, Ohio, announces that Clarence R. Hunt, formerly Pacific Coast manager, has been appointed sales manager of the fan motor department, with headquarters at the factory. H. S. Jones succeeds Mr. Hunt as manager of the San Francisco office.

The Bryant Electric Company, Bridgeport, Conn., is now offering a new tumbler switch device, known as the "Trigle" No. 2860, having three single-pole individually controlled switch mechanisms with a common feed and mounted in one porcelain cup. The device can also be furnished with two single-pole mechanisms.

The Standard Electric Stove Company, Toledo, Ohio, has placed on the market a four-plate, low-priced electric range of full capacity to retail for $90.

New Equipment Available

Cable Support

A new cable support applicable to vertical or horizontal runs and which will not crush the cable or wear the sheath has been placed on the market by the G. & W. Electric Specialty Company, 7780 Dante Avenue, Chicago. The support consists of a braided copper ribbon which is wrapped around the cable and fastened by means of screws attached to the mounting plate. The length of the copper ribbon is varied in a clamp at one end. It can be used with any diameter of cable and can serve as a grounding clamp as well as a mechanical support. It is simple to install and does not interfere with fireproofing the cable with cement.

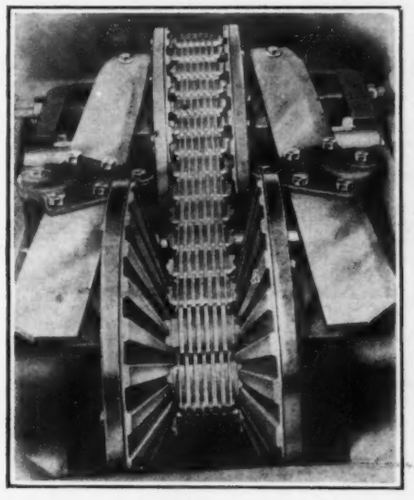
Variable-Speed Driving Gear

The "P.I.V." (positive infinitely variable) variable-speed driving gear, as shown in the illustration, has been developed by David Brownlie, 46 Grange Road, Ealing, London, W.5, and the world rights are being handled by Messrs. Close Bros., Ltd., Basildon House, 7 Moorgate, London, E.C.2, which will soon establish an American company to manufacture the gear. The gear allows of an infinite number of speed variations to be given to a driven shaft from a driving shaft with positive transmission at any centers and is adjusted by a single handle.

The gear is available in the open or inclosed type, and in one form the motor runs at 1,000 r.p.m. while the driven shaft can be varied smoothly and noiselessly within a range of 250 r.p.m. to 500 r.p.m.

The essential principle of the design of the "P.I.V." gear is the use of a driving chain of special construction, at any centers down to only a few inches if necessary, which in the standard design runs between expanding pulleys of the opposed conical disc type sloping on the inner face to the center and broader at the periphery and narrower at the hub, while also the two faces are staggered in the sense that a rib is always opposite a groove. The chain is engaged at the edges by these ribs, which act as teeth, in such a manner that the drive is truly positive.

The links are connected by rivets as usual, but a longitudinal slot is punched through, and in this is fitted a sleeve containing small thin steel plates or slats fixed vertically and loose in the sense that they can move in a direction at right angles to the travel of the chain. These slats project on either side, and as a link enters the "V" of the pulleys the ribs or teeth of one pulley face push the requisite number of slats across into the spaces between teeth on the opposed pulley face, so that the chain always engaged positively in all positions with the driving pulleys, just as much as the roller chain and sprocket wheels for example.



INCLOSED TYPE OF VARIABLE-SPEED DRIVING GEAR WITH COVER REMOVED

Variable-Voltage Equipment for Electric Power Shovels

Variable-voltage equipment that eliminates rheostatic losses has been designed by the Westinghouse Electric & Manufacturing Company for application to electric power shovels. This equipment thus keeps power costs low, increases the speed of operations, reduces operating expenses, and it is also said to be sturdy in construction. It is particularly designed for the electric shovels used in coal and iron mines, in quarries, for handling road material, by cement manufacturers, by steel plants for handling ore and slag and by contractors on dams, canals, tunnels and other large projects. The motor-generator set used with this equipment consists of a driving motor and three direct-current generators, one for each of the shovel motors.

The direct-current-type motors used with the variable-voltage equipment are so constructed as to be able to stand up under shock and strain and have a high overload capacity. Stalling or unusual overload does not injure the motor. The control for the variable-voltage system is simple but strongly constructed. Three drum controllers, one each for the swing, thrust and hoist motions, govern the speed and direction of rotation of the motors. These controllers handle only the field current of the various generators which is relatively small, thus eliminating arcing and burning of the contacts. They have removable covers making them readily accessible.

Automatic Welder

A new design of automatic arc welder which welds with great smoothness, speed and accuracy has been introduced by the General Electric Company. With this equipment the operator needs but to push a button to start the sequence of operations which produce the weld without any further effort or skill on his part. The new welder starts the arc by first touching the electrode to the work and then withdrawing it, thereafter maintaining a constant arc length by feeding the electrode wire to the weld at the exact rate of speed necessary to replace the electrode fused into the weld. It is claimed that the new equipment will perform these operations more rapidly and with a greater degree of accuracy than is possible by the most expert hand operators. The automatic welding head incorporates the necessary mechanism for feeding the electrode to the arc and consists essentially of a pair of feed rollers geared to a constant-speed motor through a magnetic clutch. The gearing and feed mechanism is contained in one housing, to which the motor is bolted.

The feed rollers feed the welding wire through the nozzle to the arc. The distance and pressure between these rollers is readily adjustable. Each welding head is equipped with a set of nozzles for $\frac{3}{32}$-in., $\frac{1}{8}$-in., $\frac{5}{32}$-in., $\frac{3}{16}$-in. and $\frac{1}{4}$-in. wire. The speed of wire feed may be adjusted by means of a selective gear changer which permits the gear ratio to be altered at will to adapt the speed of the feed rollers to the size of wire and the welding current used. Three gear speed changes can be made by moving the gear shift pin which extends from the rear of the gear housing. An additional finer adjustment can be made by means of a rheostat in the field of the motor. Provision is made for pointing the electrode backward or forward in the line of weld and also for moving it sideways. The pointing of the electrode is obtained by rotating the head on its horizontal shaft, and the lateral movement by means of the handwheel on the front of the head.

New Trade Literature

STEEL PRODUCTS. — "Copper-Bearing Steel Resists Corrosion" is the title of a booklet issued by the Truscon Steel Company, Youngstown, Ohio, which contains a treatise giving facts, figures and photographs showing the marked rust-resisting properties of steel containing a percentage of copper.

CENTRIFUGAL PUMPS.—The Ingersoll-Rand Drill Company, 11 Broadway, New York City, has issued a revised edition of the bulletin covering the Cameron single-stage double-suction volute pump. The bulletin is known as form No. 7,059. It contains illustrations showing cross-sections of the double-suction volute pumps, class LV, FV and HV, and also showing typical installations of the pumps.

PULVERIZING EQUIPMENT.—Catalog No. 18 issued by the Raymond Brothers Impact Pulverizer Company, Chicago, covers the Raymond roller mills and pulverizers with air separation for reduction of coal and many other materials to a powdered form. It contains a brief outline of the Raymond system of pulverization and air separation and also illustrations showing typical installations of the Raymond mill in prominent manufacturing plants and large central stations.

AUTOMATIC VOLTAGE REGULATOR. —Descriptive circular No. 702 issued by the American Brown Boveri Electric Corporation, 165 Broadway, New York City, describes the "A-B-B" quick-acting automatic generator voltage regulator. This circular calls attention to the distinguishing features of the voltage regulators and contains diagrams of connections of the motive system of the quick-acting regulators for three-phase current.

COLOR LIGHTING. — The Laco-Philips Company, 131 Hudson Street, New York City, is distributing a catalog of the Lace glass "colorlites" for show windows, stage lighting and other decorative uses. Illustrations are given showing the various types of Laco "colorlites" and typical installations demonstrating the latest developments in lighting practice.

REFLECTORS.—Bulletins Nos. 11 and 14 issued by Carl Zeiss, Jena, Germany, describe and illustrate the Zeiss bell reflectors for exterior and interior lighting. Illustrations are given showing the various types of lamps and typical lighting installations. A comparison of the mean direct floor illumination obtained between lamps using the Zeiss bell reflector and a similar series of filament bulbs of like power but without reflectors is included, as are light distribution curves.

OIL ENGINES. — The De La Vergne Machine Company, 957 East 138th Street, New York City, has issued bulletin No. 187, describing the water-pumping station at the Selkirk yard of the New York Central Railroad Company, equipped with De La Vergne solid-injection Diesel engines to furnish power for pumping 2,500,000 gal. of water every 24 hours. Bulletin No. 102 issued by the company describes the waterworks plant of the city of Kearney, Neb., equipped with two 300-hp. De La Vergne Diesel engines.

OIL ENGINES.—The Fulton Iron Works, St. Louis, is distributing a bulletin covering the Fulton four-cycle, air-injection Diesel engines, manufactured in sizes from 300 hp. to 2,000 hp. Illustrations showing details of construction of the engine are given, and a drawing showing cross-section through working cylinder is included.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase is desired in Nottingham, England (No. 22,985), of electric refrigerators.

An agency is desired in Vienna, Austria (No. 22,966), for electric refrigerators.

Purchase is desired in Berlin, Germany (No. 22,950), of electric portable tools.

An agency is desired in Stockholm, Sweden (No. 23,012), for automobile batteries.

An agency is desired in Gothenburg, Sweden (No. 23,046), for dishwashing machines.

An agency is desired in Berlin, Germany (No. 23,065), for electrical equipment and patented articles and novelties and radio sets and parts.

An agency is desired in Konigsberg, Germany (No. 23,063), for household appliances, electric vacuum cleaners, hair-cutting machines, manicure apparatus and electric refrigerators.

Purchase and agency are desired in Amsterdam, Netherlands (No. 23,082), for motor-driven household appliances, heating and cooking devices and electric refrigerators.

Purchase is desired in Vienna, Austria (No. 23,024), of lighting plant complete for headlight for railway engine.

Purchase and agency are desired in Antwerp, Belgium (No. 23,059), for radio accessory novelties.

An agency is desired in Buenos Aires, Argentina (No. 23,037), for radio sets and parts.

An agency is desired in Hamburg, Germany (No. 23,062), for motor-driven household appliances, heating and cooking devices and electric refrigerators.

Purchase is desired in Belgrade, Yugoslavia (No. 23,061), of electric refrigerators.

An agency is desired in Copenhagen, Denmark (No. 23,064), for electric refrigerators.

Purchase and agency are desired in Melbourne, Australia (No. 23,060), for vacuum cleaners.

Sole agency is desired in Gothenburg, Sweden (No. 23,161), for electrical coffee mills and electrically driven wiping machines for bakers and confectioners.

Purchase or agency is desired in Prague, Czechoslovakia (No. 23,120), for electrotechnical articles for dentists and physicians and household appliances, especially chafing dishes, toasters, food heaters, fans and vacuum cleaners.

MUNICIPAL HYDRO-ELECTRIC PLANT FOR QUITO, EQUADOR.—Bids will soon be asked by the Municipal Council of Quito, Equador, according to *Commerce Reports*, for the construction of a hydroelectric plant to be owned and operated by the municipality. The plans provide for a 3,000-hp. plant, for which water power with a fall of 42 meters is available.

SWITCHBOARD CABLE FOR MELBOURNE, AUSTRALIA.—Bids will be received by the Post and Telegraphs Department, Melbourne, Australia, until Jan. 18, 1927, for switchboard cable.

TRANSFORMERS FOR THE WAIKATO (NEW ZEALAND) POWER PROJECT.—Bids will be received by the Public Works Department, Wellington, New Zealand, until Feb. 15, 1927, for transformers (section 207) for the Waikato power project.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

FARMINGTON, ME.—Plans for the proposed local toy manufacturing plant to be erected by the Ted Toy-Lers, Inc., 55 South Water Street, New Bedford, Mass., include a power plant.

BILLERICA, MASS. — The Boston & Maine Railroad Company, Boston, plans to install electric power equipment in its proposed local boiler and steel plate shop, to cost about $500,000.

MIDDLEBORO, MASS. — Arrangements are being made by the Selectmen to secure high-tension current from the Plymouth (Mass.) Electric Company, which now furnishes electricity for the local system from New Bedford. Under the new contract power will be secured from the East Bridgewater power house direct to Middleboro. Under the new arrangement the transmission line from the station to the Middleboro line will be built and maintained by the Edison Electric Illuminating Company of Brockton, and the line from the local station to the Middleboro-Bridgewater line will be built by the town of Middleboro.

MILFORD, MASS.—The Board of Selectmen has called a town meeting to be held Dec. 6 to consider the installation of an ornamental lighting system on Main Street.

Middle Atlantic States

BUFFALO, N. Y.—The installation of an improved lighting system on Grider Street, between Ferry and Leroy Streets, is under consideration by the Saint Clement's Community Men's Club.

BUFFALO, N. Y.—The International Milling Company, Minneapolis, Minn., plans to install electric power equipment in its proposed flour mill and grain elevator at Catherine Street and the Buffalo River, to cost about $1,000,000.

CAZENOVIA, N. Y.—Permission has been granted the Syracuse (N. Y.) Lighting Company to erect a high-tension line in Cazenovia to supply electricity to the Rock Cut Stone.

FORT H. G. WRIGHT, N. Y.—Bids will be received by the Signal Corps, United States Army, Fort H. G. Wright, until Jan. 3, for 36-spot electric compensators (Circular 1).

FRANKFORT, N. Y.—Permission has been granted the village of Ilion to extend the transmission lines of the municipal electric system to the town of Frankfort to serve electricity in a portion of the town of Frankfort.

HARRISON, N. Y.—The taxpayers have authorized an appropriation of $12,000 for the installation of an ornamental lighting system in the business district. A resolution authorizing that the Westchester Lighting Company be directed to remove its overhead high-tension lines from the streets and place them underground was approved by the taxpayers.

MOUNT VERNON, N. Y.—The installation of an ornamental lighting system on Third Street from Sixth to Grandview Avenue is under consideration by the City Council. The plans provide for the erection of 108 standards mounted with lamps of 400 cp.

NEW YORK, N. Y.—A permit has been granted the Inwood Consumers Ice Manufacturing Company, Ninth Avenue and 213th Street, for the construction of a new plant, to cost about $100,000.

RENNSELAER, N. Y.—Permission has been granted the Upper Hudson Electric & Railroad Company, Catskill, to make extensions to its local plant and to exercise a franchise granted by the Town Board.

ROCHESTER, N. Y.—Plans are under way by the Rochester Gas & Electric Company for remodeling the Driving Park power station.

STATEN ISLAND, N. Y.—Bids will be received by the Superintendent of Lighthouses, Staten Island, until Dec. 15, for two 30-hp. vertical Diesel engine-driven air compressors (Proposal 22855).

GARFIELD, N. J.—Steps have been taken by the Garfield Board of Trade for the installation of an ornamental lighting system on Passaic Street, between River Road and Marsellus Place, to cost about $12,000.

GLEN RIDGE, N. J.—With a view of having a uniform lighting system on the county roads in Glen Ridge the Council is co-operating with the county engineer in connection with the plans for installing a new system.

LAKE DENMARK, N. J.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Dec. 7, for one rectifier, storage battery charging, with panel (Schedule 6332).

NEWARK, N. J.—Borden Farm Products Company, Inc., 110 Hudson Street, New York, plans to install electric power equipment in its proposed creamery and milk distributing plant at Orange and Nesbitt Streets, to cost about $800,000.

HUNKERS, PA.—The power plant of the Hunkers Sand & Stone Company was recently destroyed by fire.

PHILADELPHIA, PA.—Plans have been filed by the Philadelphia Electric Company for a steam-driven electric power plant at Ninth and Willow Streets, to cost about $600,000.

PHILADELPHIA, PA.—Bids will be received by the Department of City Transit, 1211 Chestnut Street, until Dec. 10, for 150 motor control equipments and 20 collector shoe fuses (Contracts 137).

BALTIMORE, MD.—The Consolidated Gas, Electric Light & Power Company is considering extensions to its power plant at 1050 North Front Street, to cost about $75,000.

HUNTINGTON, W. VA.—The Federal Power Commission has refused to grant the petition of the Eastern States Develop-

ment Company for a permit to dam the New River near its head and divert its waters into the Southern States.

MORGANTOWN, W. VA.—The West Virginia Utilities Company, has applied for permission to erect a transmission line across the Monongahela River at Scrafford.

HAMPTON ROADS, VA.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Dec. 14, for one motor-generator set and switchboard, and three switches (Schedule 6358).

MARTINSVILLE, VA.—The Appalachian Power Company, Bluefield, is negotiating for the purchase of the municipal electric plant. If taken over it plans to make extensions and improvements in this district.

WASHINGTON, D. C.—Steps have been taken by the Michigan Park Citizens' Association to secure the installation of a lighting system on Twelfth Street N. E., between Monroe Street and Michigan Avenue.

WASHINGTON, D. C.—Bids will be received by the Quartermaster, Marine Corps, Washington, until Dec. 7, for 25 transformers, 50 metal reflectors, sealing wire, street brackets, etc. (Schedule 289).

WASHINGTON, D. C.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Dec. 14, for two electric blowers for the local navy yard; also, for two for the Philadelphia yard; two for the Norfolk, Va., yard; and six for the Puget Sound navy yard (Schedule 6324).

North Central States

DOVER, OHIO.—The City Council is considering a proposal submitted by the Ohio Power Company, Canton, for the purchase of the municipal electric plant. If taken over the company contemplates extensions and improvements in this section.

OSBORNE, OHIO—The Southwestern Portland Cement Company, Los Angeles, Cal., plans to install electric power equipment in connection with proposed extensions in its local cement mill, to cost about $500,000.

SALEM, OHIO.—Estimates of cost are being prepared by B. M. French, city engineer, for the construction of a conduit system in the downtown and adjacent sections, in connection with the proposed ornamental lighting system. The conduit system will not only carry wires for the new lamps, but fire alarm, police call and other wires.

PINEVILLE, KY.—The White Star Coal Company plans to rebuild its power plant and tipple, recently destroyed by fire, with loss of about $85,000.

WICKLIFFE, KY.—The Kentucky Utilities Company, Louisville, is negotiating for the purchase of the municipal electric light and water plant.

RICHMOND, IND.—D. C. Hess, manager of the municipal electric light and power plant, has submitted a report to the Board of Public Works, in which he recommends the installation of a 10,000-kw. turbine, which will double the output of the plant. The cost is estimated at $300,000.

WHITING, IND.—The Fisher Sash & Door Company plans to install electric power equipment in connection with the proposed rebuilding of its plant, recently damaged by fire, with loss of about $200,000.

ATLANTA, ILL.—Permission has been granted the Atlanta Water & Light Company to erect and operate power lines in and around Lawndale.

CHICAGO, ILL.—The Chicago, North Shore & Milwaukee Railroad Company, plans to build two substations, one to be located at Winnetka and the other at Fort Sheridan, each to cost $25,000.

EAST ST. LOUIS, ILL.—Arrangements are being made by the Union Electric Light & Power Company for the erection of a high-tension line to connect the Alton district with its Cahokie power plant. The proposed line will provide about 30,000 hp. and the terminus will be at Federal, near Alton.

HILLSDALE, ILL.—Permission has been granted the Rock River Valley Light & Power Company to erect a distribution line from Hillsdale to Wheelock and to furnish electricity to residents along the line.

LINCOLN, ILL.—Authority has been granted the Lincoln Water & Light Company to erect and maintain a transmission line from Lincoln to Beason and to supply electricity in that city.

FLORENCE, WIS.—Bonds to the amount of $10,000 have been voted for the installation of an ornamental lighting system on Central Avenue.

MADISON, WIS.—The Wisconsin Power & Light Company plans to erect a transmission line between the towns of Windsor and Leeds, 4 miles long.

MADISON, WIS.—Application has been made by the Wisconsin Power & Light Company to the State Railroad Commission for permission to build a hydro-electric plant on the Roche a Cri River, near Adams.

MARINETTE, WIS.—The installation of an ornamental lighting system on Hall Avenue, from State Street to Dunlap Square; on Main Street from Dunlap Square to Church Street, and on Homer Street from Waldo Street to Ogden Street, to cost about $20,000, is under consideration by the City Council.

MENASHA, WIS.—Plans have been prepared by the Wisconsin Traction, Light, Heat & Power Company, Appleton, to erect a transmission line along Highway 15 from Menasha to Appleton to serve rural consumers along the route. When this line is completed the question of illuminating the highway between the two cities will be taken up.

NEW RICHMOND, WIS.—The erection of a high-tension transmission line from New Richmond to Amery, a distance of 25 miles, is contemplated by the W. B. Foshay Company, Minneapolis.

TOMAH, WIS.—The Wisconsin Power & Light Company, Madison, contemplates erecting a 33,000-volt transmission line (1 mile long) and moving the local substation to adjoin its local steam power plant.

WAUPUN, WIS.—The plans to erect a high-tension line between Beaver Dam and Waupun, as reported in the issue of Nov. 6, have been discarded by the Wisconsin Power & Light Company, Madison, and it now proposes to connect with the Madison-Sheboygan 66,000-volt transmission at Chester, giving Waupun both steam and hydro-electric power. A substation will be built at Waupun. A lower tension line will then be erected along Highway 31 from Waupun to Beaver Dam to serve the rural sections in that district.

AUSTIN, MINN.—The erection of an electric transmission line from the municipal electric light plant to Lansing is under consideration by the city officials.

COBDEN, MINN.—The City Council has awarded a contract for the erection of a high-tension line from Sleepy Eye to Cobden and a distribution system in Cobden.

EVAN, MINN.—Bonds to the amount of 6,000 have been voted to install an electrical distribution system in Evan.

MINNEAPOLIS, MINN.—Bids will be received by F. S. Gram, city purchasing agent, until Dec. 7 for 833 lamp standards for use in the city parks.

ST. PAUL, MINN.—Plans are under consideration by the City Council for the installation of ornamental lamps on Asbury, Simpson, Pacal and Albert Avenue, between Blair and Minnehaha Streets. G. M. Shepard is city engineer.

SAUK CENTER, MINN.—The dam and water right of the Central Minnesota Power & Milling Company has been purchased by the City Council.

TWO HARBORS, MINN.—Bids will be received by Ernest Carlson, city clerk, until Dec. 6 for furnishing and installing one 250-hp. water tube boiler, one jet-condenser, two flow meters, etc.

CEDAR FALLS, IOWA.—A committee has been appointed by the City Council to investigate the proposal to install illuminated gateways at the five main highway entrances to the city. C. J. Connell is a member of the committee.

MINNEWAUKAN, N. D.—Contract has been awarded by the Otter Tail Power Company, Fergus Falls, for the construction of a substation, transmission line and remodeling the local distribution system.

BOLIVAR, MO.—Permission has been granted C. T. Brotherton to erect transmission lines to supply electricity to Willard and Bois D'Arc.

ST. LOUIS, MO.—Bids will be received by the Board of Public Service until Dec. 14 for furnishing electricity for a period of ten years for all district street-lighting substations now in existence and which may be built during that period, for lighting streets, parks and other public places. Bids will be taken at the same time for furnishing current for a period of two years for park and incandescent lighting circuits and for traffic signals.

BANCROFT, NEB.—The City Council has entered into a contract with the Nebraska Gas & Electric Company, Lincoln, to supply electricity to operate the municipal electric system. Authority has been given the company to erect a 60-cycle, 16,500-volt transmission line from Oakland to Bancroft, and to reconstruct an existing line, now operating at 33,000 volts.

BEATRICE, NEB.—Plans are under way by the Gage County Electric Company to enlarge its power house and install new equipment, at a cost of about $70,000. The company has been granted permission to issue capital stock to finance the project.

NORTH LOUP, NEB.—Tentative arrangements have been made by the City Council and the Nebraska Power Company, Omaha, to take over the municipal electric plant and to supply power from its high-tension lines for the local system. An election will be held on Dec. 29 to submit the proposal to the voters for approval.

Southern States

AHOSKIE, N. C.—The Virginia Electric & Power Company, Richmond, which is negotiating for the purchase of the municipal electric plant, plans to extend its transmission lines to this section.

GREENSBORO, N. C.—The North Carolina Public Service Company plans to erect a distribution line to McLeansville and also a line from Guildford to a point near Friendship.

MOUNT AIRY, N. C.—Bids will be received by the Mayor and Board of Town Commissioners at the office of the town clerk, until Dec. 14 for waterworks improvements, including pumping station, storage reservoir, filter plant equipment, motor-driven centrifugal pump, etc. The Gilbert C. White Company, Durham, is engineer.

NEWBERN, N. C.—A suburban development, including electric light, water, sewer, telephone systems, etc., is under consideration by the Fort Totten Real Estate Company. J. A. Meadows and J. H. Jones, Newbern, are interested in the project.

HOBOKEN, GA.—The Hoboken Land & Development Company plans to purchase an electric power plant for rural service.

LAKE CITY, FLA.—Arrangements are being made by the Florida Power & Light Company, Miami, which has acquired the municipal electric plant, to install an ornamental system in the business district. The power plant is being remodeled at a cost of about $20,000. Surveys are being made for extensions of transmission lines to Live Oak, Madison and Branford, which will be supplied with electricity from the local plant.

MIAMI SHORES, FLA.—Bonds to the amount of $175,000 have been voted for municipal improvements, of which $35,000 will be used for street lamps and equipment.

DOYLE, TENN.—Plans for the proposed paint manufacturing plant to be built by the Standard Paint & Pigment Company, to cost about $200,000, include a power plant.

KNOXVILLE, TENN.—Plans are being considered by the Knoxville Power & Light Company to rebuild its transmission line in North Carolina Avenue, between Broadway and Park Avenue.

AMORY, MISS.—The installation of an ornamental lighting system is under consideration.

SENATOBIA, MISS.—The municipal electric light and water plant has been acquired by the General Power & Light Company, Chicago. The terms of the contract provide that the company will build a large central power plant, to cost about $300,000, which will supply electricity to surrounding cities in this territory as well as Senatobia.

HEBER SPRINGS, ARK.—The property of the Arkansas Public Utilities Company has been acquired by the Arkansas Light & Power Company, Pine Bluff.

AMITE, LA.—Extensions are contemplated by the Central Louisiana Power Company, including installation of new equipment and erection of additional transmission lines.

AMARILLO, TEX.—The Badger Ice Company, Inc., Oklahoma City, Okla., contemplates building an ice manufacturing plant of 150 tons daily capacity, to cost about $250,000.

EL PASO, TEX.—The El Paso Electric Company is erecting an emergency 13,200-volt transmission line into the upper valley, to cost about $50,000.

Pacific and Mountain States

SEATTLE, WASH.—The Barton Packing Company plans to install electric power equipment in connection with a proposed addition to its plant, to cost about $500,000.

WHITE SWAN, WASH.—The White Swan Light & Water Company has applied to the Commissioners of Yakima County for a franchise to install an electric light and power system in White Swan.

FRESNO, CAL.—The Madary Planing Mill Company, Santa Clara Street, plans to install electric power equipment in connection with the rebuilding of its mill recently damaged by fire, with loss of about $150,000.

LOS ANGELES, CAL.—The contract for installing an ornamental lighting system on Vermont Avenue has been awarded to the Newberry Electric Company, 726 South Olive Street, at $76,888.

LOS ANGELES, CAL.—The Board of County Supervisors, Hall of Records, plans to install ornamental lamps on Allen Avenue and adjoining streets.

LOS ANGELES, CAL.—The Board of County Supervisors has approved plans for the installation of ornamental street lamps on Woodward Avenue, and other streets in the Michilinda district.

LOS ANGELES, CAL.—The City Council has adopted an ordinance, providing for the installation of ornamental street lamps on Cheremoya Avenue, Beachwood Drive and other streets, using concrete standards.

LOS ANGELES, CAL.—The installation of ornamental lamps on portions of West Boulevard, Alma Street, Thirty-eight Place and York Boulevard is under consideration by the City Council. J. C. Shaw, City Hall, is engineer.

SAN DIEGO, CAL.—The City Council is considering the installation of ornamental street lamps on portions of Moore, California, Andrews and Winder Streets, using pressed steel standards.

SAN DIEGO, CAL.—Bids will be received by the Board of County Supervisors until Dec. 13, for the installation of ornamental lamps on Jefferson Avenue, Kensington Park Subdivision.

TOOLE, UTAH.—The City Council is considering the installation of an improved street-lighting system in the downtown section.

MEDICINE LAKE, MONT.—The Montana-Dakota Power Company, Fairmont, N. D., which has acquired the property of the Medicine Lake Electric Utilities, plans to extend its transmission line here. The company is also negotiating for the purchase of the municipal electric plant at Miles City.

Canada

FREDERICTON, N. B.—The Maritime Electric Company, Ltd., has submitted a proposal to the City Council offering to extend its plant in Fredericton, at a cost of about $75,000, and to furnish service at a lower cost than estimated in the Weston-Stephens report.

CAMPBELLFORD, ONT.—The Water and Light Commission is considering the erection of a transmission line, to cost about $12,000.

FENWICK, ONT.—The Hydro-Electric Power Commission of Ontario, Toronto, is considering extensions in its transmission system north of Fenwick and thence to Effingham.

HAWKESBURY, ONT.—Application has been made by the Ottawa-Montreal Power Company, Ottawa, to the Public Service Commission of the province of Quebec for authority to erect a transmission line from Hawkesbury along the north shore of the Ottawa River, through Buckingham and Templeton, to connect with the power plants at Hull, Que.

INGERSOLL, ONT.—The Hydro-Electric Power Commission of Ontario plans to extend its local substation, at a cost of about $15,000.

SHAWINIGAN FALLS, QUE.—A water power development in little river, Shawinigan Falls, is contemplated by A. Giguere.

SHAWINIGAN FALLS, QUE.—Permission has been granted the Electric Service Corporation to erect a transmission line between St. Celestine and Ste Monique.

Electrical Patents

Announced by U. S. Patent Office

(Issued Nov. 2, 1925)

16,453 (reissue). THERMO-ELECTRIC ELEMENT; O. Hermann, Chicago, Ill. App. filed Feb. 9, 1926. Consisting of an alloy composed of substantially 81 per cent of nickel, 17 per cent of molybdenum and 2 per cent of vanadium.

1,604,964, 1,604,965. REGULATOR SYSTEM; W. M. Bradshaw and J. H. Ashbaugh, Wilkinsburg, Pa. Apps. filed Sept. 22, 1923. For governing the operation of hydraulic prime movers. A system of the above-indicated character that shall be responsive not only to changes in speed, but upon which variations in load will become effective prior to effects caused by such load variations upon the speed of the prime mover.

1,604,972. HEATER; E. K. Clarke, West Orange, N. J. App. filed Oct. 24, 1925. May be employed on vehicles for the purpose of heating bottles or the like; is electrically operated and becomes operative when the bottle is placed therein.

1,604,979. ELECTRIC HEATER; M. D. Dominguez, New Orleans, La. App. filed Nov. 22, 1923. Instantaneous type.

1,604,980. AUTOMATIC HOT-WATER HEATER; M. D. Dominguez, New Orleans, La. App. filed April 29, 1924. An automatic hot-water tank with a heating unit in the center of the bottom so as to have its effect upon the coldest portion of the water; using a pressure-operated switch with thermostatic means to control the same.

1,604,998. CONSTANT-SPEED MOTOR; A. R. Rutter, Pittsburgh, Pa. App. filed Jan. 26, 1921. An induction motor that shall have a substantially constant speed, irrespective of the change in applied voltage. An induction motor comprising a core member having a central leg and two side legs separated from the central leg by air gaps, an armature disposed adjacent the legs, a main winding surrounding the central leg, an auxiliary winding surrounding the side leg and a portion of the central leg, and means for inductively connecting the auxiliary winding to the main winding.

1,604,999. HEATING UNIT FOR PERMANENT HAIR WAVING; W. Schmitz, New York, N. Y. App. filed May 21, 1925.

1,605,015. CIRCUIT-INTERRUPTING SYSTEM; H. A. Travers, Forest Hill Borough, Pa., and C. McL. Moss, Pittsburgh, Pa. App. filed Nov. 13, 1919. Remotely controlled system. To prevent an electrically operated circuit interrupter from being held closed when a short circuit or heavy overload obtains thereon.

1,605,019. ELECTRIC HEADLAMP, MORE PARTICULARLY FOR MINERS; P. Wolf, Zwickau, Germany. App. filed June 9, 1925.

1,605,020. GAS RESPONSIVE MEANS FOR CHARGING STORAGE BATTERIES AND THE LIKE; J. L. Woodbridge, Philadelphia, Pa. App. filed July 21, 1924. Means responsive to the evolution of gas and useful for controlling the charging current of a storage battery.

1,605,033. CONNECTER; G. Jensen, Swissvale, Pa. App. filed Nov. 3, 1919. For use in systems employing potentials and currents of relatively high values. A connecter, of the resilient-clamp type; a readily operable safety connecter, that may be manipulated by an operator with his bare hands without danger of injury from the connecter; a connecter adapted to receive and position effectively one or more conductors of various sizes.

1,605,038. IMPULSE STARTER FOR MAGNETOS; A. C. Kleckner, Racine, Wis. App. filed Dec. 24, 1923.

1,605,051. REGULATOR SYSTEM; W. E. Menzies, Irwin, Pa. App. filed June 14, 1923. That shall govern the speeds of a number of motors and that shall maintain a substantially constant speed ratio between them; in which the amount of correction upon each motor is directly proportional to the angular displacement from normal with respect to a master speed-reference means. Applicable to a paper-making machine.

1,605,052. CIRCUIT INTERRUPTER; H. R. Meyer and L. G. Riley, Wilkinsburg, Pa. App. filed Oct. 6, 1919. Latching means for interrupters of the railway or inclosed arc-extinguishing type.

1,605,061. INDUCTION SUPPLY METER; P. Paschen, Nuremberg, Germany. App. filed May 18, 1922. Having a special shunt magnet and means for controlling the starting torque and for controlling the influence of the brake magnet; pertaining to the adjustment of the phase difference between the driving magnetic fluxes of the main magnet and the shunt magnet.

1,605,069. CATENARY HANGER; H. N. Richards, Pittsburgh, Pa. App. filed Oct. 16, 1922.

1,605,071. METHOD OF ARC WELDING; V. L. Bonci, Brooklyn, N. Y. App. filed May 9, 1925. To weld easily oxidizable metals in the presence of air while excluding all atmospheric oxygen from the weld.

1,605,084. SWITCH MECHANISM; E. H. W. Ullrich, New York, N. Y. App. filed Feb. 21, 1921. Of the safety inclosed type. Wherein the live contact members and switch elements are normally inaccessible and wherein the fuses are disposed in a separate compartment and are protected by a cover interlocked with the switch.

1,605,087. METHOD OF AND APPARATUS FOR GETTERING FILAMENTS; C. A. Weller, Bloomfield, N. J. App. filed Dec. 8, 1923. For applying a substance to a filament of incandescent lamps to prolong the useful life thereof.

1,605,103. ARRANGEMENT FOR THE REMOTE TRANSMISSION OF THE POSITION OF POINTERS; F. Eichler, Berlin, and M. Schleicher, Berlin-Charlottenburg, Germany. App. filed June 3, 1926. Particularly of the pointers of measuring instruments, and pertaining more specifically to a system or arrangement of this kind in which means are provided which bring the pointers, the position of which is to be transmitted to a remote station, in contact with a resistance arrangement which may be connected either as a voltage divider or as regulating resistance.

1,605,112. SLOT-CLOSING STRIP FOR SLOTTED COIL-CARRYING MEMBERS OF DYNAMO-ELECTRIC MACHINES; P. Huggins, Wakefield, England. App. filed April 23, 1926. A wedge of magnetic material which provides a continuous magnetic path across the gap, but a discontinuous metallic or conducting layer along the gap.

1,605,136. MOTOR PROTECTIVE DEVICE; W. R. Nimmo, Bellevue, Mich., and W. S. Tull, Jackson, Mich. App. filed Feb. 8, 1923. A circuit maker and breaker for inclusion in a tripping circuit for the protection of motors, including a pair of curved arms adapted to encircle substantially a motor shaft, pivoted at one end and movable inwardly and outwardly; yieldable means for normally maintaining the curved arms at the limit of their inward movement, and circuit-controlling means associated with the curved arms and actuated by the outward movement of the same for operating a circuit breaker or circuit switch. To prevent burn-outs owing to the rotor coming in contact with the stator.

1,605,168. SWITCH BOX; W. W. Burk and R. A. Fox, Forest, Ohio. App. filed Nov. 25, 1924. Having adjustable securing members which may be secured in their positions of adjustment after the box has been properly positioned, eliminating the necessity of adjusting the flanges prior to the positioning of the box.

1,605,192. PROCESS FOR PRODUCING NON-SAG TUNGSTEN WIRE; P. McAllister, Bloomfield, N. J. App. filed Dec. 23, 1922.

1,605,216. RELAY; A. T. Carter, Albany, N. Y. App. filed Nov. 14, 1922. For controlling the operation of railway-signaling devices.

1,605,222. ELECTRIC SIGN CONTROLLER; L. G. Deses and A. de Mendoza, Mexico. App. filed Oct. 6, 1925. For the electric lamps of a sign to produce a series of words, pictures or the like that move across or along the sign.

1,605,243. ELECTRIC POWER APPARATUS; E. H. Knapp and C. Finch, Maysville, Ky. App. filed July 20, 1921. Automatic electric power plant driven by an internal-combustion engine.

1,605,275. TIME RELAY; W. H. Petersen, Gamla Posten, Ludvika, Sweden. App. filed Nov. 4, 1924. Comprising a heating member and an electromagnet, but having a minimum of movable parts. The heating member itself or a part in close connection therewith forms part of the magnetic circuit and consists of a material which is ferromagnetic at ordinary temperature but becomes only feebly magnetic at a comparatively low rise of temperature, so that it will act as a large air gap in the magnetic circuit and reduce the attraction on an armature sufficiently to permit it to be pulled away from the magnet and effect release. The rest of the magnetic circuit preferably is composed mainly of iron, and the heating member forming a part thereof may lie immediately adjacent to the air gap between the fixed portion of the circuit and the armature.

Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

The Ever-Expanding Number of Consumers

THE remarkable activity in building construction during recent years had an influence on many other branches of industry. One of its effects was to add, in extraordinary measure, to the number of consumers of central-station energy.

This by no means implies that it was the sole factor. As a matter of fact, central-station companies have carried on aggressive campaigns to build up their loads; they have stimulated the wiring of old residences, have worked up domestic appliance loads, have added to their commercial business, have taken over many industrial loads formerly served from private plants and have constantly extended their area of operation.

However, the erection of new buildings, and in particular of new residential buildings, has unquestionably contributed strongly to the increase in the number of consumers.

In this connection it is of interest to observe what actually occurred in a city in the 250,000 to 500,000 population group, for which statistics covering the past ten years have recently become available. During the decade the number of electrical consumers increased three-and-one-half-fold. For the war years and immediately afterward the annual increase was moderate, being, in 1919, less than 5 per cent of the number then connected. That is easily understood in the light of the prevailing national situation. It was a period when resources were being strained to the utmost to supply the demands of the existing consumers. The tendency was rather to limit extensions than to stimulate them.

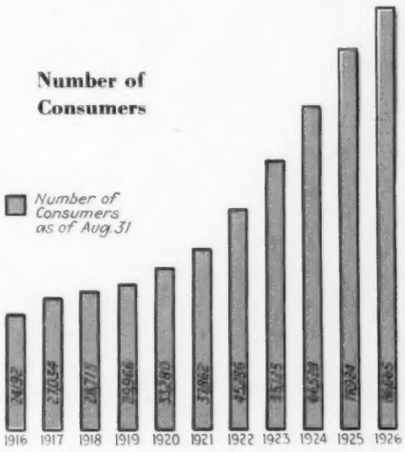
The next few years were marked by a tremendous building boom. The accumulated deficiency in housing facilities and the general increase in incomes, which made it possible for many families to gratify a desire to live in better homes than previously, conspired to create an acute demand. The hectic activity to meet that demand added new electrical consumers at an unprecedented rate. Thus, in the city under consideration, in the single year 1924 the number of consumers increased by 20 per cent. Examination of local building statistics confirms the conclusion based on national averages.

It is evident that the expansion is still going on, and at a rate greatly exceeding that of a decade ago. However, it would also seem that the record number of new consumers added in 1924 cannot be considered normal and cannot be indefinitely repeated.

That view is supported by the data here presented. The total number is still growing at a rate exceeding 10 per cent, but the increase is gradually becoming slower as the territory is more and more thoroughly served.

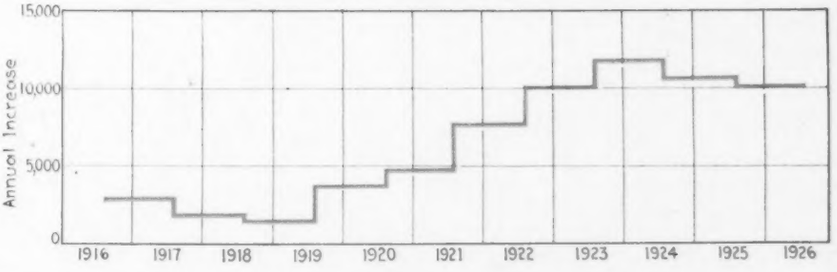
Analysis of the past three years by months shows a similar story. With a few exceptions the change has been consistent for any given time of the year.

Although data for a specific company have been used, the general picture is of broader significance. The conclusion seems to be that the growth of the electrical load, which is going on apace, will in the future come from increasing the load per consumer, for which there is as yet no limit in sight, more largely than from an indefinite increase in the number of consumers, which in the end does approach a limit, determined by the number of homes and business establishments.

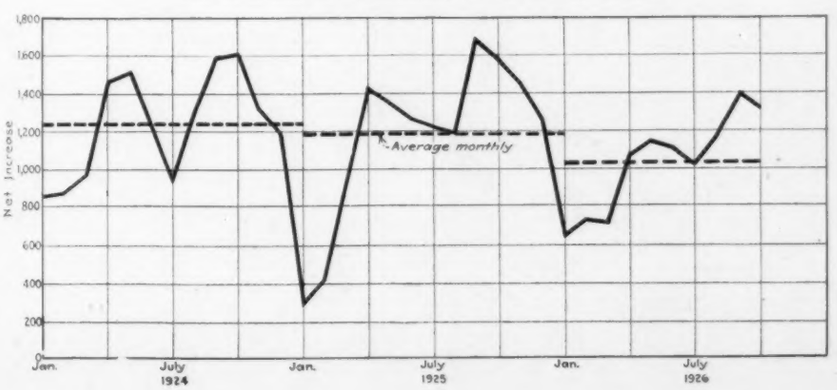


Most of the data for statistics in the ELECTRICAL WORLD are gathered by it from original sources. Privilege is freely given to readers of the ELECTRICAL WORLD to quote for use these statistics for any legitimate purpose. While there is no requirement that the source of data be given, yet it would help the ELECTRICAL WORLD in obtaining and compiling further basic information if those who make use of these statistics would give credit to the ELECTRICAL WORLD.

Annual Increase in Number of Consumers



Net Number of Consumers Added Each Month



New England Industry Operating at High Rate

THE improvement in New England industrial conditions which started in August was continued through September and October. In fact, October activities were only slightly below those of March, which witnessed the highest degree of manufacturing activity recorded in any month since the boom period during the first half of 1923. The activities of the last three months seem to indicate that New England industry is in a fair way toward finishing out the present year with record operations. Such is the picture of industrial activities depicted by data received by the ELECTRICAL WORLD on the consumption of electrical energy by manufacturing plants of that section.

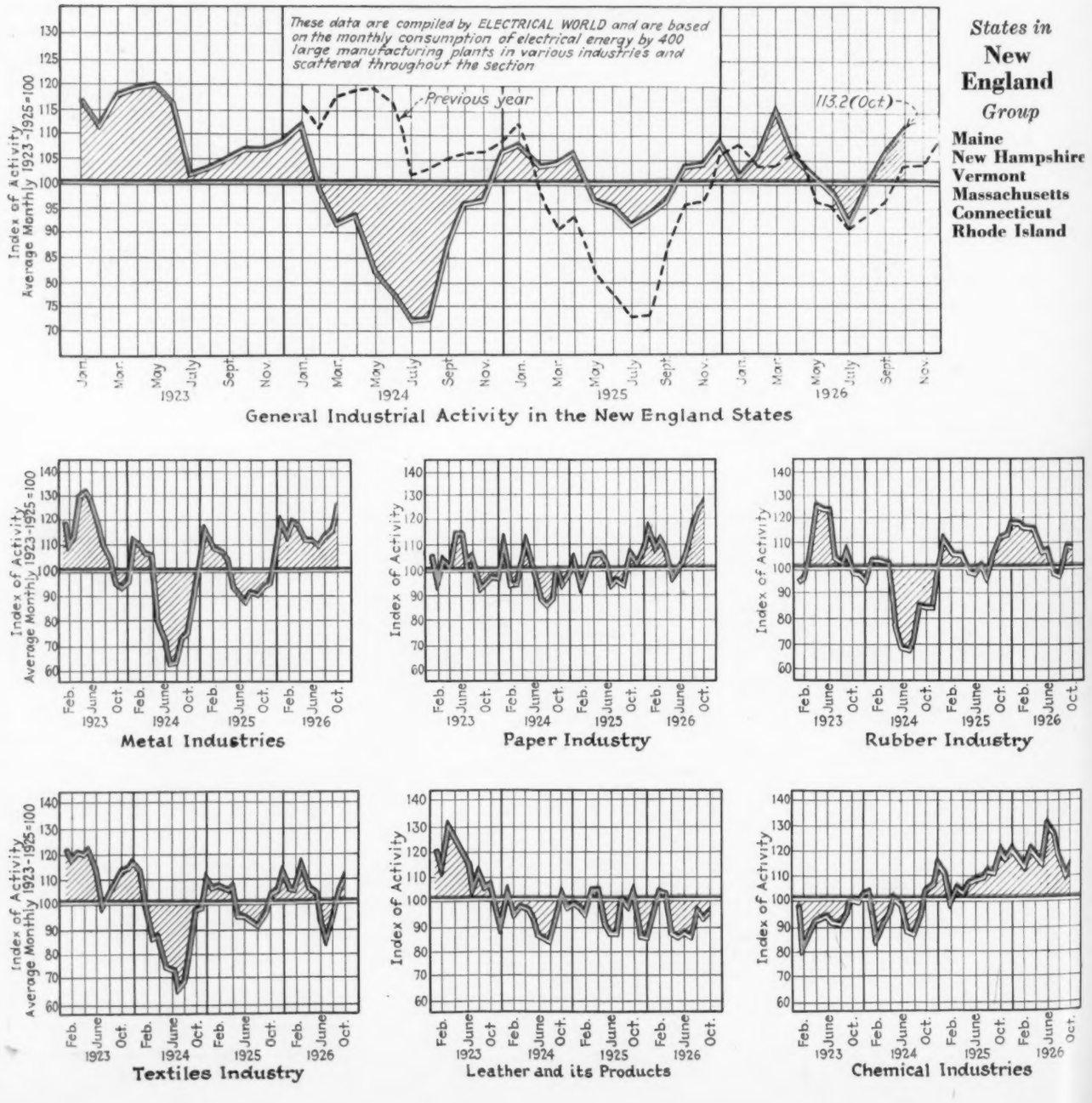
The month of October witnessed an upward trend in all of the six outstanding industries of the New England States. Industry in general was operating during October at 5.5 per cent over September and 8.8 per cent above October of last year. Operations were also 13.2 per cent above the monthly average for the past three years. New England seems to have responded to the national upward trend witnessed since the close of the summer months to a greater degree than any other section of the country. This has been due largely to the near-capacity operations of the textile mills, although, as indicated above, all of the outstanding industries were operating at increased capacity.

In the textile centers of New England many of the mills have resumed full-time schedules, and others that have been closed down for some considerable period have reopened. The textile industry during October was operating at 9.2 per cent above the operations reported for last year and 12 per cent over the monthly average for the past three years. October operations, however, were still about 5.4 per cent under the peak activities reported during March of this year.

The leather industry was still operating at a low rate of activity, October operations being about 12 per cent under those of October last year and 4.6 per cent under the monthly average for the past three years. Operations in the rubber industry were virtually the same as during the month of September.

"Electrical World" Barometer of Industrial Activity in the New England States

(Data Unadjusted for Seasonal Variation)


These data are compiled by ELECTRICAL WORLD and are based on the monthly consumption of electrical energy by 400 large manufacturing plants in various industries and scattered throughout the section
Previous year
113.2(Oct.)
Index of Activity Average Monthly 1923-1925=100
States in New England Group
Maine
New Hampshire
Vermont
Massachusetts
Connecticut
Rhode Island
General Industrial Activity in the New England States
Metal Industries
Paper Industry
Rubber Industry
Textiles Industry
Leather and its Products
Chemical Industries